TRANSPORTATION IMPACT AND ACCESS STUDY

Edgemere Crossing at Flint Pond

Shrewsbury, Massachusetts

PREPARED FOR

Route 20 Nominee Trust and
Demoulas Super Markets, Inc.
881 East Street
Tewksbury, MA 01876

PREPARED BY

101 Walnut Street
PO Box 9151
Watertown, MA 02471
617.924.1770

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1

Introduction

Vanasse Hangen Brustlin, Inc. (VHB), on behalf of Route 20 Nominee Trust and Demoulas Super Markets, Inc. (collectively, the "Proponent"), has prepared this transportation impact and access study (the "Study") for the construction of a mixed use development of approximately 145,000 square feet (SF) of commercial space and approximately 250 rental residential units (the "Project"), to be built on an approximately 68-acre site located along Route 20 in Shrewsbury, Massachusetts (the "Site", or "Project Site"). This traffic study has been prepared in conformance with the Massachusetts Department of Transportation's (MassDOT) Transportation Impact Assessment (TIA) Guidelines [1] and is consistent with the Town of Shrewsbury's local requirements for site plan and special permit submissions.

Project Summary

The proposal involves the construction of a mixed-use development located on an approximately 68-acre Site along Route 20 in Shrewsbury, Massachusetts (the "Project"). The existing Site was formerly the Edgemere Drive-In Theater and is currently abandoned. Figures 1 and 2 show the Site location and Project Site context, respectively.

The Project includes the construction of an approximately 80,000 square foot (SF) Market Basket supermarket, 50,000 SF of general retail space, 13,000 SF of pharmacy space, a 2,000 SF drive-in bank, and 250 units of rental residential units. Access to the Site will be provided via an unsignalized driveway along Route 20 (which restricts left-turns exiting the site) in the general location of the current driveway and a signalized, full-access driveway at the

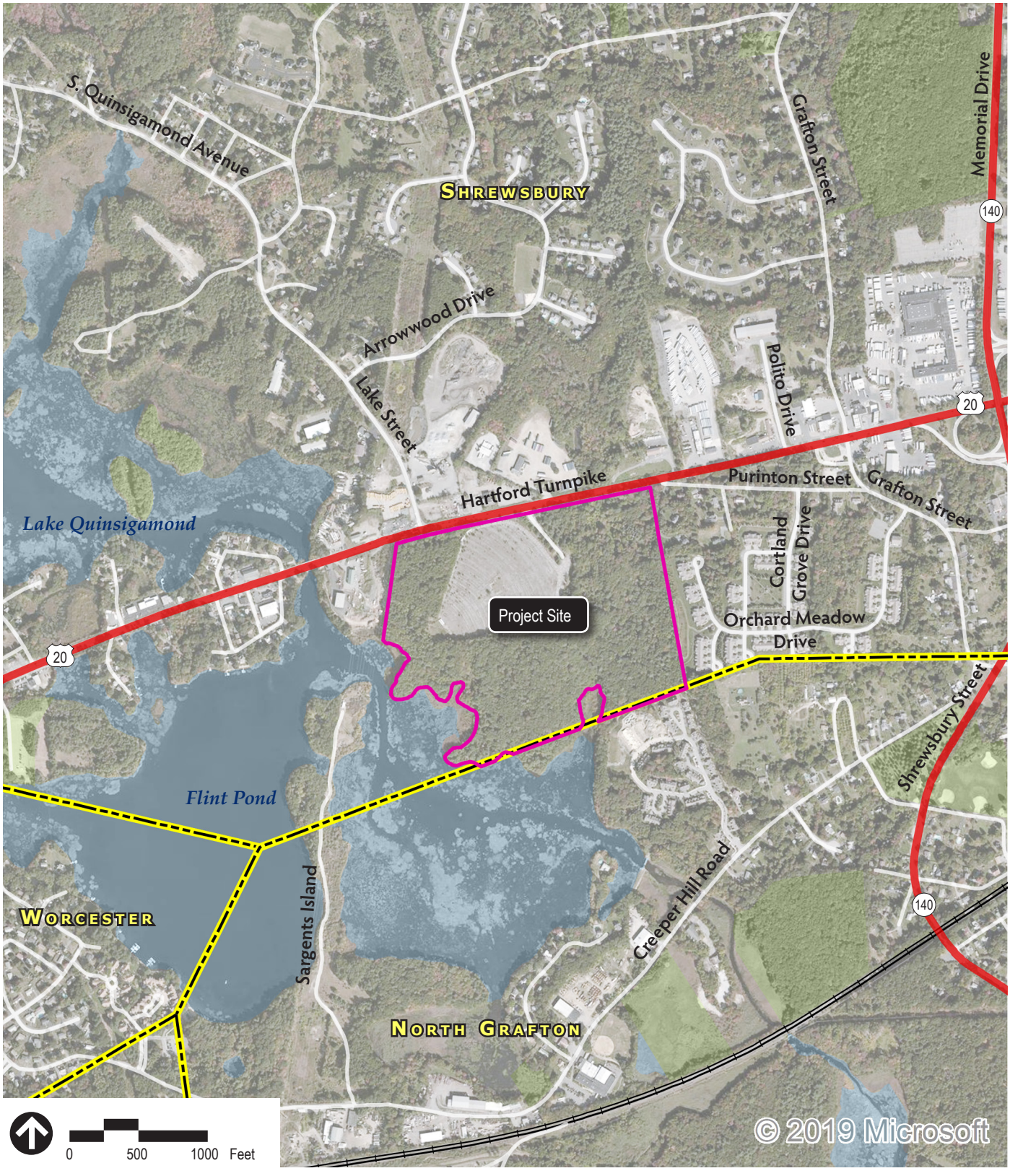
[1] *Transportation Impact Assessment (TIA) Guidelines*, Massachusetts Department of Transportation, March 13, 2014.

Source: USA Topo Maps

Figure 1

Site Location Map

Edgemere Crossing at Flint Pond
Shrewsbury, Massachusetts



Source: MassGIS

Figure 2

Project Site Context

Edgemere Crossing at Flint Pond
Shrewsbury, Massachusetts

intersection of Route 20 and Lake Street. Full internal access for vehicles and pedestrians will be provided between the residential and commercial components of the Project.

Project Permitting Status

The Project is subject to local review through the Town of Shrewsbury's typical site plan and special permit review process. Additionally, it is subject to review pursuant to the Massachusetts Environmental Policy Act (MEPA) office because the proposed development requires one or more state agency permits and exceeds review thresholds established under the MEPA implementing regulations (301 CMR 11.03). MEPA jurisdiction is limited to those aspects of the Project that are within required or potentially-required state permits that may cause Damage to the Environment as defined in the MEPA regulations, including traffic and transportation, greenhouse gas emissions and air quality, wetlands, and stormwater.

The Project meets/exceeds the following MEPA review thresholds requiring an Environmental Notification Form (ENF) and an Environmental Impact Report (EIR):

- 11.03(1)(b)(2): Creation of five or more acres of impervious area;
- 11.03(6)(a)(6): Generation of 3,000 or more New adt on roadways providing access to a single location; and
- 11.03(6)(a)(7): Construction of 1,000 or more New parking spaces at a single location.

This study is being submitted to the Town of Shrewsbury for use in the local approval process. The Draft and Final Environmental Impact Reports which will be submitted to MEPA and MassDOT as well as the Town of Shrewsbury, and other interested stakeholders, will include

Study Methodology

This traffic assessment was conducted in three stages consistent with the MassDOT traffic study guidelines. The first stage involved an assessment of existing traffic conditions within the Project area, including an inventory of existing roadway geometry, observations of traffic flow, collection of daily and peak period traffic counts, and a review of traffic safety in the area.

The second stage of the Study established the framework for evaluating the transportation impacts of the Project. Specific travel demand forecasts for the Project were assessed along with future traffic demands on the study area roadways due to projected background traffic growth and other proposed area development that may occur independent of the Project. Per MassDOT guidelines, the year 2026 (a seven-year time horizon) was selected as the design year for analysis in the preparation of this Study. Analysis of area traffic operations in the year 2026 would fully reflect the effects of the proposed development as well as background traffic independent of the proposed development.

The third and final stage of the study discusses possible measures to mitigate, improve, and address long-standing existing and potential future traffic operations in the area.

2

Existing Conditions

Evaluation of the transportation impacts associated with the Project requires a thorough understanding of the existing transportation system in the Project study area. The analysis of existing transportation conditions is based on the existing roadway network, roadway/ intersection geometry, traffic control, existing daily and peak hour traffic volumes, traffic safety conditions, and existing public transportation.

Site Conditions

The 68-acre Site currently includes the abandoned Edgemere Drive-In Theater. The Site is abutted by Route 20 to the north, Flint Pond to the west, the North Grafton Town Line to the south, and residences to the east. The property is located within the Town of Shrewsbury's Commercial-Business Zoning District and Route 20 Overlay District.

Site Access

Access to the existing Site is currently provided via a driveway along Route 20, east of Lake Street. The driveway along Route 20 provided access to the Edgemere Drive-In Theater that is no longer operational.

Parking

Parking on the existing site for the former drive-in theater is now predominantly broken asphalt and there are no striped parking spaces provided on the parcel.

Study Area

The following study area intersections were discussed with representatives of the Central Massachusetts Regional Planning Commission, Town of Shrewsbury, and MassDOT. The following 14 intersections comprise the study area for this assessment and are illustrated in Figure 3:

- Route 20 at Massasoit Road/Millbury Avenue
- Route 20 eastbound ramps at Route 122 (Grafton Street) (east intersection)
- Route 20 eastbound ramps at Route 122 (Grafton Street) (west intersection)
- Route 20 westbound ramps at Route 122 (Grafton Street)
- Route 122 (Grafton Street) at Blithewood Avenue
- Route 122 (Grafton Street) at Sunderland Road
- Sunderland Road at Lake Avenue
- Route 20 at Sunderland Road/Westborough Street
- Route 20 at Edgemere Boulevard
- Route 20 at Grafton Street
- Route 20 eastbound ramps at Route 140 (Memorial Drive)
- Route 20 westbound ramps at Route 140 (Memorial Drive)
- Route 20 at Lake Street/Site Driveway (west)
- Route 20 at Site Driveway (east)

Figure 4 presents the existing intersection lane geometry and traffic control at each of the study area intersections.

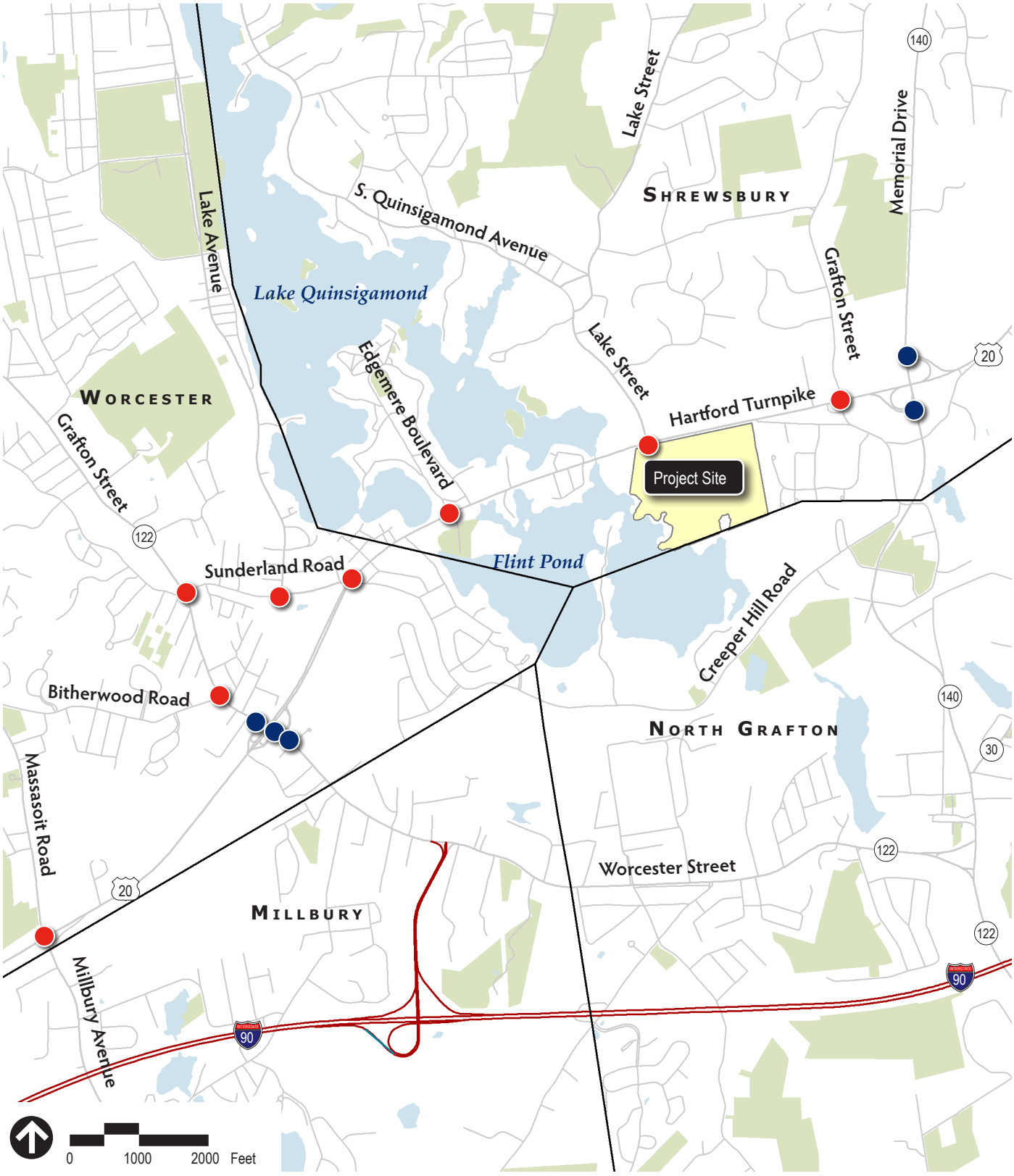
Roadway Network

The Project Site is bounded by Hartford Turnpike (US Route 20) to the north. Figure 5 shows the study area roadway jurisdiction.

- **Hartford Turnpike (US Route 20)** is generally oriented in the east/west direction, providing access to/from Worcester in the west and Northborough in the east. Route 20 is classified as an urban principal arterial under the jurisdiction of MassDOT. Within the vicinity of the Site, Route 20 is comprised of two lanes in the east direction and one lane in the west direction. The posted speed limit is 40 miles per hour (mph) within the vicinity of the Site. No sidewalks are provided along the roadway within the vicinity of the site. Land use consists of a mix of industrial, commercial, and residential uses.

Traffic Volumes

Daily traffic volumes were collected at three locations over a 72-hour period in January 2019 (Saturday through Tuesday, excluding Sunday) using automatic traffic recorders (ATR). These



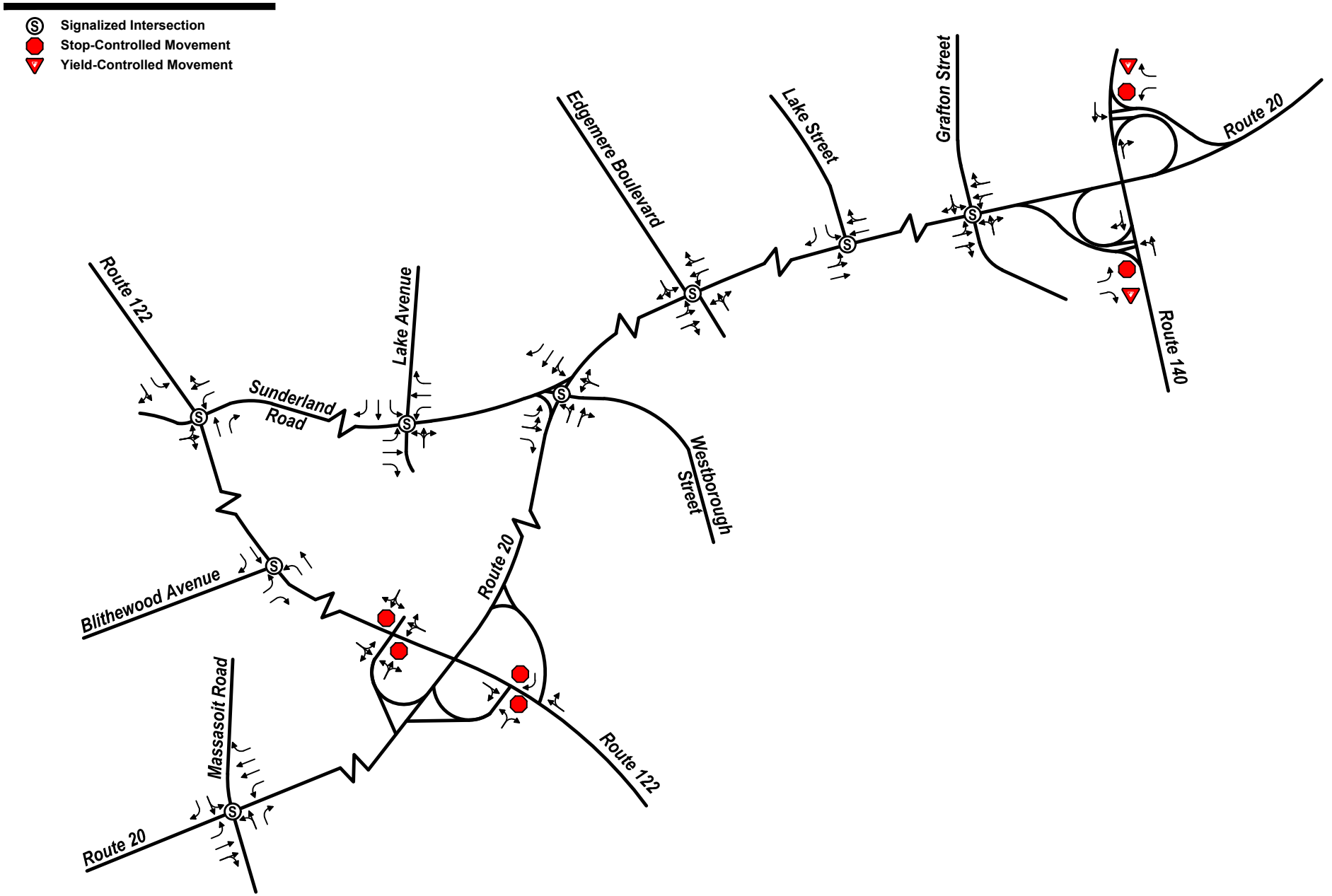
Source: MassGIS

- Signalized Intersection
- Unsignalized Intersection

Figure 3

Study Area Intersections

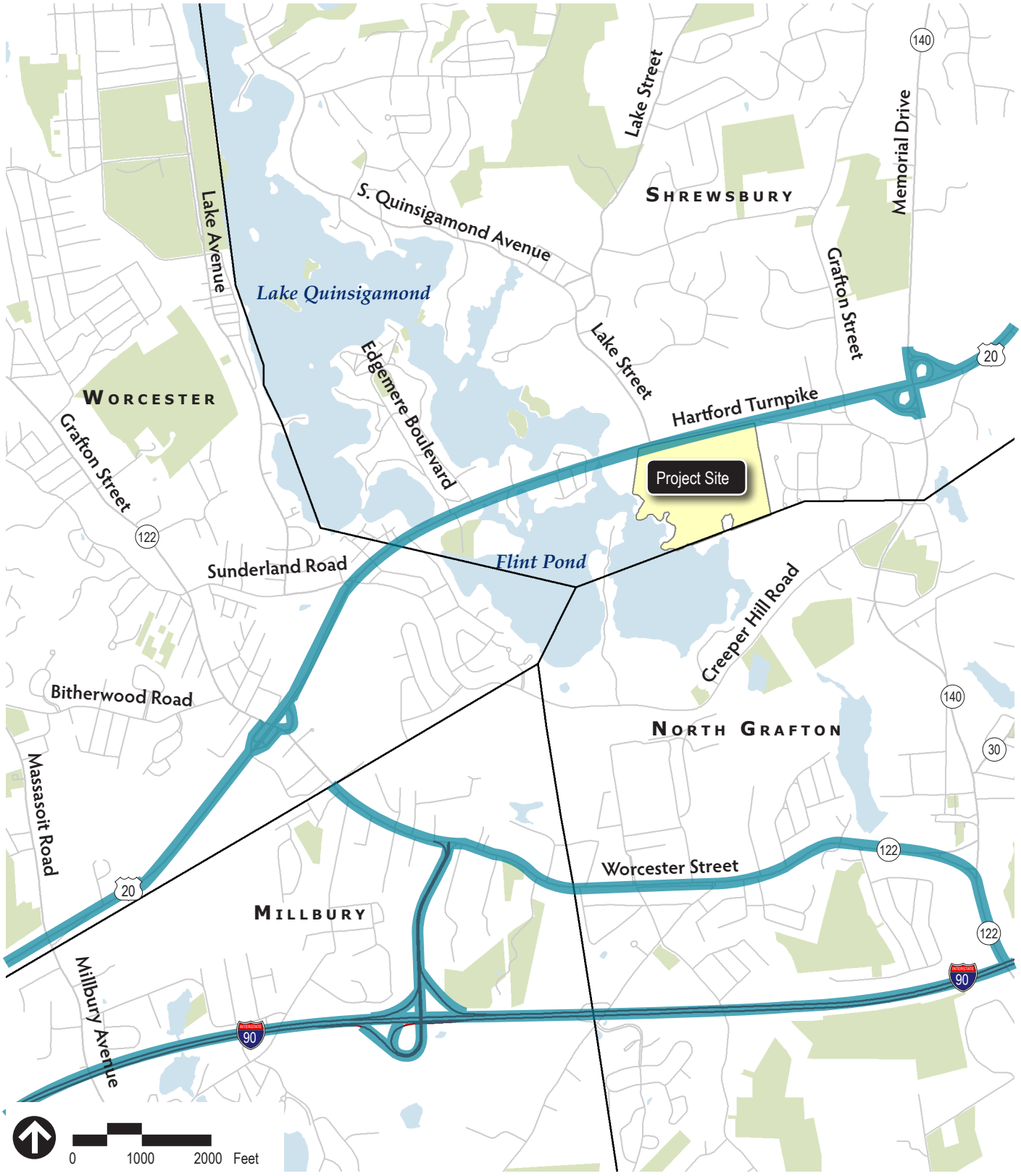
Edgemere Crossing at Flint Pond
Shrewsbury, Massachusetts



Not to Scale

Figure 4
Intersection Lane Geometry and Traffic Control

Edgemere Crossing at Flint Pond
Shrewsbury, Massachusetts



Source: MassGIS

MassDOT Roadway

Local Roadway

Figure 5

Roadway Jurisdiction

Edgemere Crossing at Flint Pond
Shrewsbury, Massachusetts

dates represent typical days for traffic count purposes (non-holidays) while local schools were in session. The volumes are summarized in Table 1 and included in the Appendix.

As shown in Table 1, Route 20 between the Route 122 ramps carries approximately 19,400 vehicles on a typical weekday with the morning and evening peak hours accounting for 7.6% and 9.2% of the weekday daily traffic flow, respectively. On a typical Saturday, Route 20 between the Route 122 ramps carries approximately 16,300 vehicles with the midday peak hour accounting for 8.5% of the Saturday daily traffic flow. Traffic flow along Route 20 is heavier in the eastbound direction during the weekday morning peak hour and heavier in the westbound direction during the weekday evening and Saturday midday peak hours.

Route 20 east of Lake Street carries approximately 22,400 vehicles on a typical weekday with the morning and evening peak hour accounting for 7.6% and 8.0% of the weekday daily traffic flow, respectively. On a typical Saturday, Route 20 east of Lake Street carries approximately 17,600 vehicles with the midday peak hour accounting for 8.2% of the Saturday daily traffic flow. Traffic flow along Route 20 is heavier in the eastbound direction during the weekday morning peak hour and heavier in the westbound direction during the weekday evening and Saturday midday peak hours.

Table 1 Existing Traffic Volume Summary

Location	Weekday ADT [1]	Weekday Morning Peak Hour			Weekday Evening Peak Hour			Saturday ADT	Saturday Midday Peak Hour		
		Volume [2]	K Factor [3]	Dir. Dist. [4]	Volume	K Factor	Dir. Dist.		Volume	K Factor	Dir. Dist.
Route 20 Between Route 122 Ramps	19,400	1,480	7.6%	58% EB	1,790	9.2%	65% WB	16,300	1,385	8.5%	53% WB
Route 20 East of Lake Street	22,400	1,705	7.6%	64% EB	1,795	8.0%	63% WB	17,600	1,440	8.2%	52% WB
Route 20 Between Route 140 Ramps	21,000	1,745	8.3%	72% EB	1,650	7.9%	66% WB	16,600	1,395	8.4%	50% WB

Source: VHB based on automatic traffic recorder counts conducted in January 2019.
Note: Peak hours do not necessarily coincide with the peak hours of turning movement counts.
1 Average Daily Traffic volume expressed in vehicles per day.
2 Peak Hour traffic volumes expressed in vehicles per hour.
3 Represents the percent of daily traffic that occurs during the peak hour.
4 Directional distribution of peak hour traffic.

Route 20 between the Route 140 ramps carries approximately 21,000 vehicles on a typical weekday with the morning and evening peak hour accounting for 8.3% and 7.9% of the weekday daily traffic flow, respectively. On a typical Saturday, Route 20 between the Route 140 ramps carries approximately 16,600 vehicles with the midday peak hour accounting for 8.4% of the Saturday daily traffic flow. Traffic flow along Route 20 is heavier in the eastbound direction during the weekday morning peak hour and heavier in the westbound direction during the weekday evening and Saturday midday peak hours.

Concurrent with the ATR counts, turning movement counts (TMCs) were conducted at the study area intersections in January 2019 during the weekday morning and evening peak periods from 7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM, respectively. TMCs were also conducted at the study area intersections during the Saturday midday peak period from 11:00 AM to 2:00 PM. The TMC data indicates that, within the study area, the weekday morning and evening peak hours generally occur between 7:30 AM and 8:30 AM and 5:30 PM and 6:30 PM, respectively. In addition, the Saturday midday peak hour generally occurs between 11:30 AM and 12:30 PM.

Seasonal Variation

MassDOT historical traffic counts were reviewed to understand the seasonality of traffic count data collected in the month of January within the study area. Data for seasonal variation of traffic volumes on Route 9 in Shrewsbury indicate that traffic counts in January are generally lower (by as much as eight-percent) than during the average month. Since the January count data were found to be lower than annual average conditions, an eight-percent seasonal adjustment factor was applied to the traffic data. The MassDOT traffic count data are included in the Appendix.

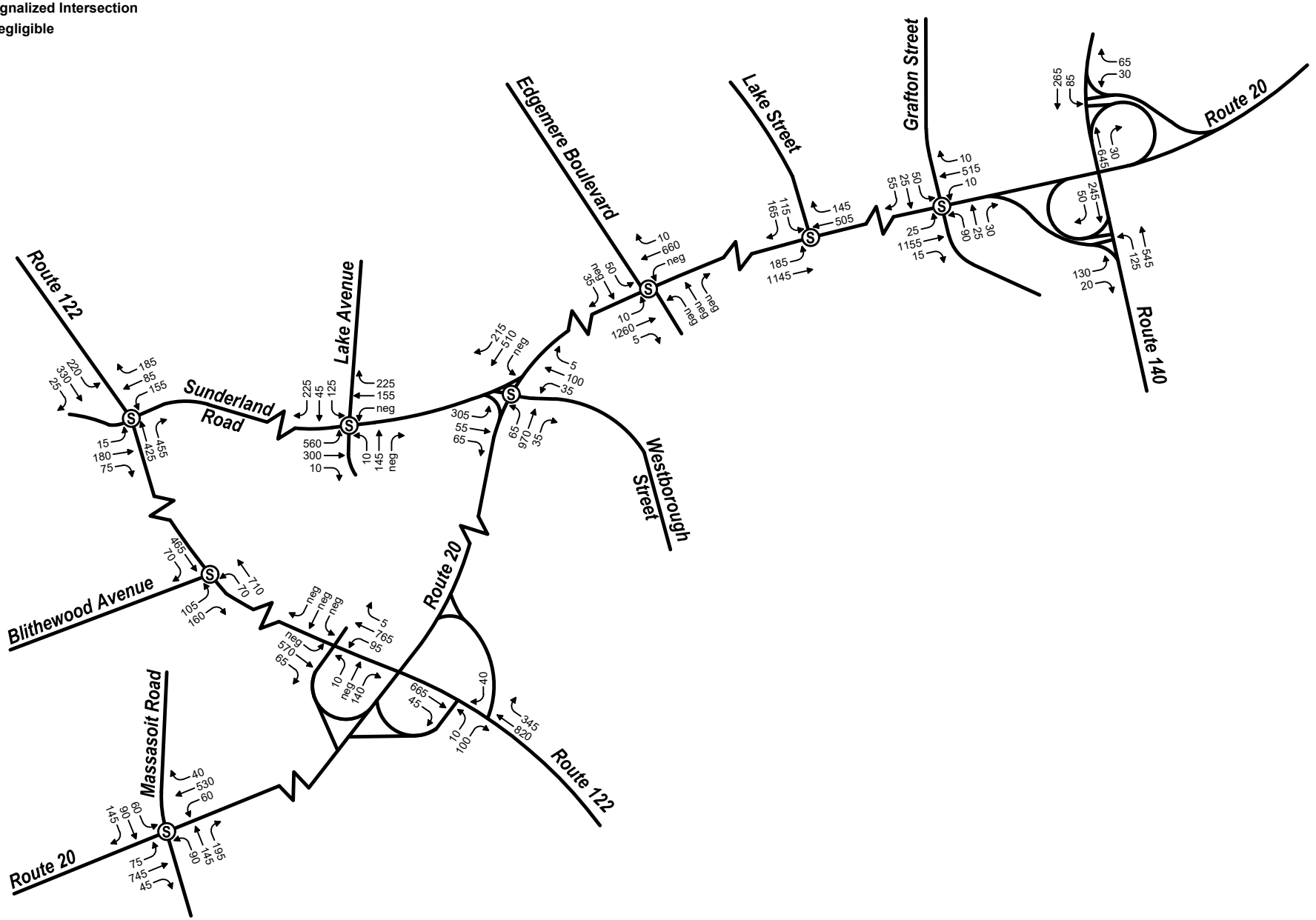
Figures 6, 7, and 8 illustrate the resulting 2019 Existing traffic volume conditions during the weekday morning, weekday evening and Saturday midday peak hours, respectively.

Crash History

To identify motor vehicle crash trends in the Project study area, the most current crash data for the study area intersections were obtained from MassDOT for the five-year period from 2012 through 2016. A summary of the vehicular crash data is presented in Table 2 and included in the Appendix.

In addition to the collision summary, incident occurrence was compared to the volume of traffic through an intersection to determine degree of significance. Accordingly, crash rates were calculated for each study area intersection and compared with the statewide and district-wide averages. MassDOT average crash rates for District 3 (the MassDOT district designation for Shrewsbury) are 0.89 and 0.61 for signalized and unsignalized intersections, respectively. In other words, on average, 0.89 crashes occurred per million vehicles entering signalized intersections, and 0.61 crashes occurred per million vehicles entering unsignalized intersections throughout District 3. A potential safety problem may exist when an intersection's crash rate exceeds these averages. The crash rate worksheets for the study area intersections are included in the Appendix.

Ⓢ Signalized Intersection
neg = Negligible



Not to Scale

Figure 6
2019 Existing Conditions
Weekday Morning Peak Hour Traffic Volumes
Edgemere Crossing at Flint Pond
Shrewsbury, Massachusetts

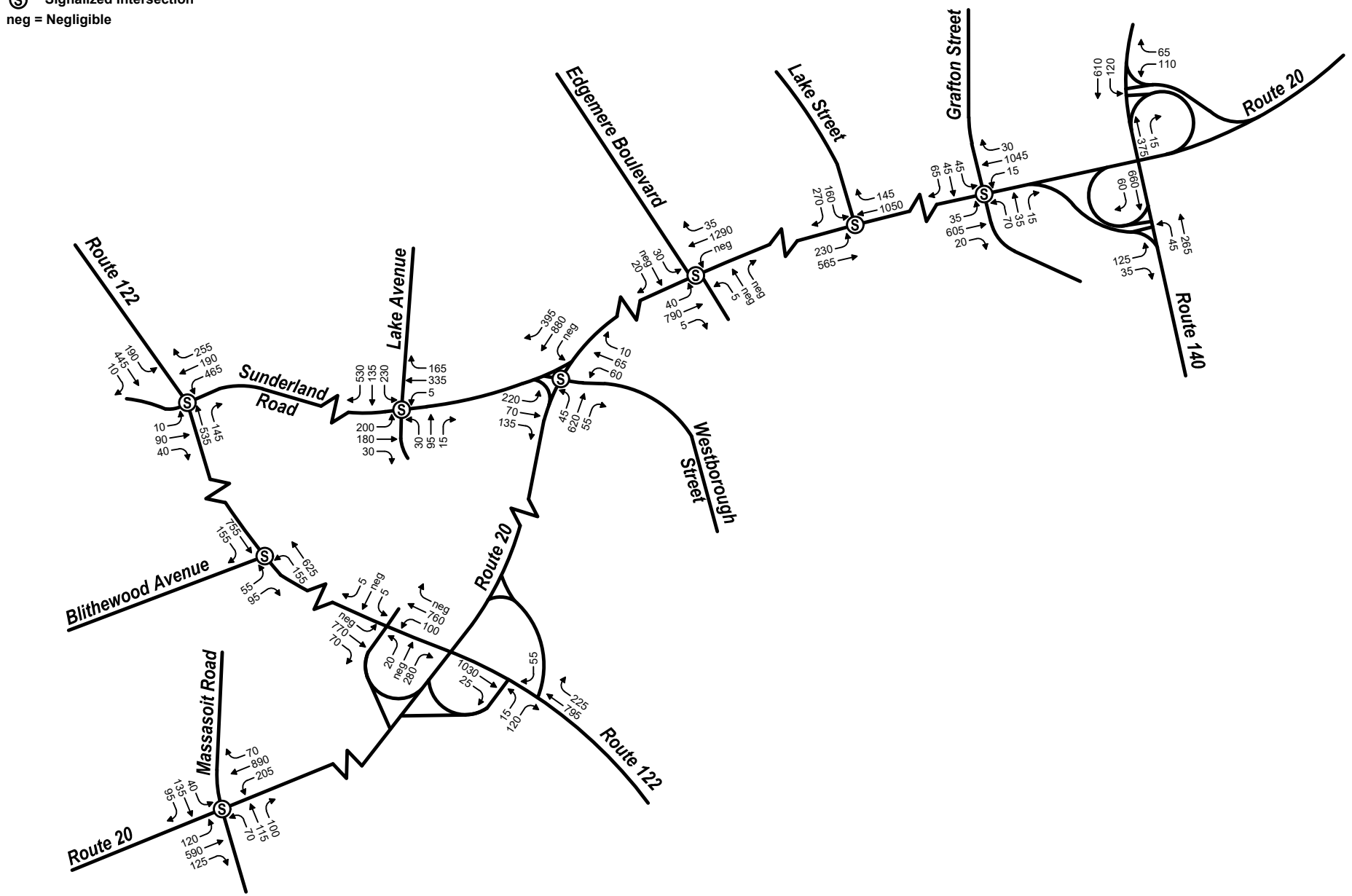


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Figure 7
2019 Existing Conditions
Weekday Evening Peak Hour Traffic Volumes
Edgemere Crossing at Flint Pond
Shrewsbury, Massachusetts

Ⓢ Signalized Intersection
neg = Negligible

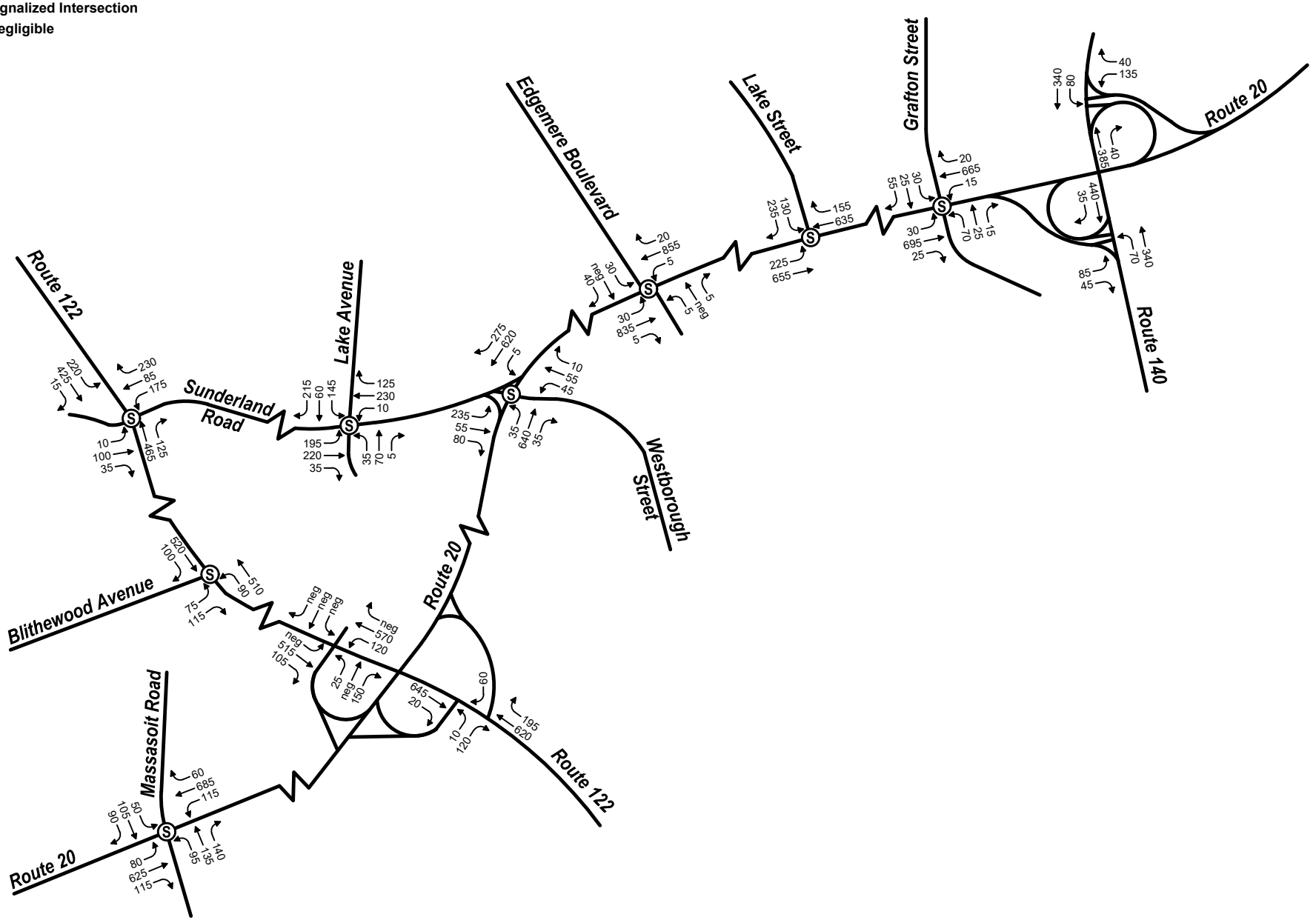

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Figure 8
2019 Existing Conditions
Saturday Midday Peak Hour Traffic Volumes
Edgemere Crossing at Flint Pond
Shrewsbury, Massachusetts

As shown in Table 2, the following study area intersections have a calculated crash rate over the district average:

- Route 122 at Sunderland Road,
- Route 20 at Sunderland Road/Westborough Street,
- Route 20 at Lake Street, and
- Route 20 at Grafton Street

Most reported crashes at the study area intersections were identified as angle and rear-end collisions that resulted in property damage only. One fatal crash was reported at intersection of Route 20 at Grafton Street. Crashes involving non-motorists (bike, pedestrian) occurred at the following intersections:

- Route 122 at Blithewood Avenue (one crash),
- Route 122 at Sunderland Road (three crashes),
- Sunderland Road at SW Commons Driveway/ Lake Avenue (one crash), and
- Route 20 at Sunderland Road/Westborough Street (one crash).

Table 2 Intersection Vehicular Crash Summary (2012 – 2016)

	1 Rt 20 at Massasoit Rd/ Millbury Ave	2 Rt 122 at Rt 20 EB Ramps (East)	3 Rt 122 at Rt 20 EB Ramps (West)	4 Rt 122 at Rt 20 WB Ramps/ Davis Dwy	5 Rt 122 at Blithewood Ave	6 Rt 122 at Sunderland Rd	7 Sunderland Rd at SW Commons Dwy/ Lake Ave	8 Rt 20 at Sunderland Rd/ Westborough St	9 Rt 20 at Edgemere Blvd/ Parking Lot	10 Rt 20 at Lake St	11 Rt 20 at Grafton St	12 Rt 140 at Rt 20 EB Ramps	13 Rt 140 at Rt 20 WB Ramps
Signalized?	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
MassDOT Average Crash Rate	0.89	0.61	0.61	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.61	0.61
Calculated Crash Rate	0.85	0.17	0.03	0.08	0.35	1.23	0.57	1.37	0.53	1.01	2.61	0.09	0.33
Exceeds Average?	No	No	No	No	No	Yes	No	Yes	No	Yes	Yes	No	No
Year													
2012	5	1	0	1	1	10	7	4	5	2	10	0	0
2013	13	0	1	0	2	14	2	19	5	10	23	1	1
2014	4	2	0	1	3	12	2	17	4	8	18	1	3
2015	5	3	0	1	1	9	6	10	2	18	27	0	2
2016	14	1	0	0	5	10	4	16	6	8	21	0	2
Total	41	7	1	3	12	55	21	66	22	46	99	2	8
Collision Type													
Angle	18	1	0	1	2	20	10	29	3	15	60	1	3
Head-On	2	0	0	0	0	4	0	4	1	0	4	0	0
Rear-End	15	4	1	2	4	23	6	14	9	21	15	0	2
Sideswipe, Opposite Direction	1	1	0	0	2	0	1	1	1	0	1	0	0
Sideswipe, Same Direction	1	0	0	0	1	4	0	11	8	5	10	0	1
Single Vehicle Crash	4	1	0	0	3	4	3	4	0	2	5	1	1
Unknown/Not Reported	0	0	0	0	0	0	1	3	0	3	4	0	1
Severity													
Fatal Injury	0	0	0	0	0	0	0	0	0	0	1	0	0
Non-Fatal Injury	17	2	1	1	2	10	6	20	7	6	28	0	1
Property Damage Only	23	4	0	1	9	41	15	42	15	39	67	2	6
Unknown/Not Reported	1	1	0	1	1	4	0	4	0	1	3	0	1
Time of Day													
Weekday, 7:00 AM – 9:00 AM	5	4	0	1	2	4	4	7	3	4	13	0	0
Weekday, 4:00 – 6:00 PM	7	1	0	0	2	9	2	10	3	12	13	0	1
Saturday, 11:00 AM – 2:00 PM	0	0	0	0	0	0	0	2	0	1	3	0	0
Weekday, Other Time	19	1	1	2	6	29	10	32	13	22	53	2	5
Weekend, Other Time	10	1	0	0	2	13	5	15	3	7	17	0	2
Pavement Conditions													
Dry	32	5	1	2	10	44	15	44	17	37	81	1	5
Wet	6	1	0	1	2	7	3	12	5	7	10	1	2
Snow	1	0	0	0	0	1	3	8	0	1	1	0	1
Sand, Mud, Dirt, Oil, Gravel	0	0	0	0	0	0	0	0	0	0	1	0	0
Ice	1	0	0	0	0	1	0	0	0	0	1	0	0
Slush	1	1	0	0	0	1	0	0	0	0	1	0	0
Unknown/Not Reported	0	0	0	0	0	1	0	2	0	1	4	0	0
Non-Motorist (Bike, Pedestrian)	**0**	**0**	**0**	**0**	**1**	**3**	**1**	**1**	**0**	**0**	**0**	**0**	**0**

Source: MassDOT crash portal, accessed February 2019.

Road Safety Audits

The Highway Safety Improvement Program (HSIP)[2] identifies crash clusters which are eligible for possible safety funding. Based on MassDOT designations, there are three 2014-2016 intersection HSIP clusters identified within the study area:

- Route 20 at Grafton Street,
- Route 20 at Sunderland Road/Westborough Street,
- Route 20 at Massasoit Road.

Consistent with MassDOT guidelines, and at the request of MassDOT officials, a Road Safety Audit (RSA)[3] was conducted by VHB at the intersection of Lake Street and Route 20 (as this was previously an HSIP-eligible location and will serve as the main entrance and exit for the site. As part of the MEPA process, the Proponent will work with MassDOT to identify if RSAs are required at these other three locations and will prepare them as required.

For the Lake Street and Route 20 location noted above, detailed crash reports were obtained from the Town of Shrewsbury and Massachusetts State Police and were summarized as part of the preparation of the RSA. The Proponent worked with MassDOT, the Town of Shrewsbury, and other appropriate parties to arrange the RSA, and the RSA was conducted on May 14, 2019. The RSA report identifies safety issues and potential enhancements.

Public Transportation

There is currently one transit service, provided by the Worcester Regional Transit Authority (WRTA) that operates within the study area. The following section describes the existing local services.

It should be noted that the Grafton Commuter Rail Station (located over 4.5 miles from the Project Site), which is part of the Worcester Line and is provided by the Massachusetts Bay Transportation Authority (MBTA). Bus service is provided by the Worcester Regional Transit Authority (WRTA) along Route 9 to the north of the Project Site but is not expected to offer any real benefit to this Project Site.

The Proponent will work with the Town of Shrewsbury in discussions with the WRTA to explore the possibility of expanding bus service to the Project Site. Should the WRTA be open to potentially modifying an adjacent bus route if the demand to/from the Project Site warrants, the Proponent will make appropriate accommodations within the site to provide for a bus shelter, as needed. Please refer to Chapter 5 for a discussion of the full Transportation Demand Management (TDM) program proposed as part of the Project.

[2] According to the MassDOT website, "an HSIP-eligible location is a crash cluster that ranks within the Top 5% of each Regional Planning Agency, based on a combination of factors including crash incidence and severity (Using the Equivalent Property Damage Only (EPDO) index where Property Damage Only crashes = 1 Point; Injury crashes = 5 Points; Fatal crashes = 10 points)."

[3] *Road Safety Audit, Route 20 at Lake Street, May 14, 2019* prepared by VHB

Worcester Regional Transit Authority

The WRTA operates one bus route within 1.25 miles of the Site. No bus routes provided by the WRTA are immediately adjacent to the Site. The WRTA has fixed bus stops and operates on a wave system. The wave system allows a rider to wait in a designated location on the same side of the street as the bus along the route and simply wave a hand to alert the bus driver to stop. The WRTA provides service Monday through Sunday with buses departing from and returning to the Union Station HUB located in downtown Worcester.

The WTRA bus route that operates within the vicinity of the Site is Route 5 (Southwest Commons via Grafton Street). WRTA Bus Route 5 provides service between the Central Hub at Union Station and Southwest Commons in Shrewsbury. The route operates along Grafton Street and Route 20 in the study area with the closest fixed stop at Southwest Commons off Route 20. Service runs from 5:30 AM to 8:50 PM on weekdays with approximate one-hour peak headways and from 6:00 AM to 8:35 PM on Saturdays with approximate one-hour peak headways. Transit route and service details are included in the Appendix.

Pedestrian and Bicycle Accommodations

Within the vicinity of the Site, there are essentially no pedestrian nor bicycle accommodations (sidewalks, crosswalks, bike lanes, etc.) provided along Route 20 or along Lake Street. At some of the more remote locations and intersections, there are these amenities, but they would not directly benefit this location. See Chapter 5 (Mitigation) for a more detailed discussion on how these amenities will be addressed and provided as part of the Project Buildout.

3

Future Conditions

To determine future roadway operations, traffic volumes in the study area were projected to the year 2026 to reflect a seven-year planning horizon from the 2019 Existing conditions. The seven-year planning horizon is consistent with Massot's TIA Guidelines.

Traffic volumes on the roadway network under future conditions without the Project (No-Build) have been estimated to include existing traffic, new traffic due to regional and area background traffic growth, and traffic related to any specific nearby development projects expected to be completed by the 2026 horizon year. Roadway improvements proposed within the boundaries of the study area were also considered and incorporated where appropriate. The anticipated traffic volumes from the Project were added to the No-Build traffic volumes to reflect future conditions with the Project in place (Build).

No-Build Conditions

The 2026 No-Build traffic volumes were determined by considering existing traffic volumes and adding regional traffic growth and traffic from other known nearby developments. Traffic growth is generally a function of expected new development, fluctuations in demographics, and changes in automobile usage and ownership in the region. Regional traffic growth is projected by examining historic traffic growth trends.

Regional Traffic Growth

To establish a rate at which traffic volumes can be expected to grow within the design horizon, discussions were held with Town of Shrewsbury officials and a review was conducted of growth rates used in traffic studies conducted for other developments in the

Town of Shrewsbury as well as historic count data. Based on this research, an annual growth rate of 1.0% was used for this Study.

Planned/Approved Developments

In addition to accounting for background growth, the traffic associated with other planned/ approved developments near the Site was also considered. Based on discussions with Town of Shrewsbury officials, there are two planned/approved developments within the vicinity of the study area that were considered as part of the background development.

- **Senior Housing (579 & 585 Lake Street**) – The project includes the construction of 33 Senior housing Units. The project is located at 579 and 585 Lake Street in Shrewsbury, Massachusetts.
- **The Botanist** – The project includes the redevelopment of an existing building, retrofit to be a retail/medical marijuana dispensary. The existing building is approximately 4,000 SF. The project is located at 235 Hartford Turnpike in Shrewsbury, Massachusetts.

Traffic volumes to be generated by these projects were produced using Institute of Transportation Engineers (ITE) data[4] as no published traffic studies submitted as part of the permitting process for these projects were identified. The projected trips for these background developments are included in the Appendix.

It should be noted that there were several potential projects were highlighted by Town of Shrewsbury officials. These projects were not included as part of the specific background traffic growth due to their distance from the Site or because there are limited details on the development program/timeline available at this time. However, to some degree, these Project-related trips are anticipated to be accounted for as part of the annual regional traffic growth. When new projects are proposed to the Town of Shrewsbury, it would be expected that their impacts would be detailed in a similar traffic impact study as this one.

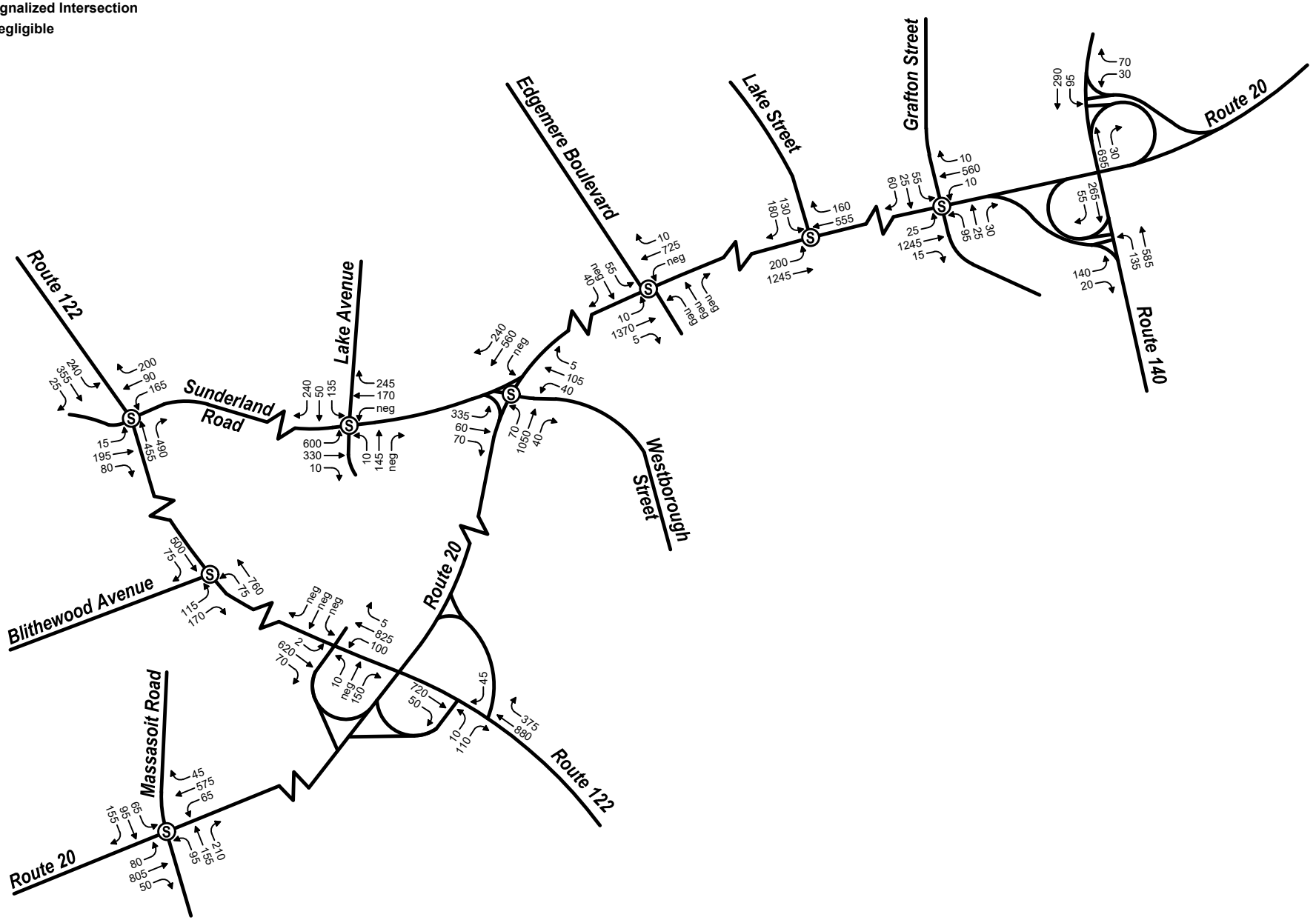
Of note is the proposed project located at 939 Boston Turnpike (a marijuana dispensary). While the impacts of this project are not specifically known, the proponent and the highway design being proposed in Chapter 5 (Mitigation) has considered the driveways for this site and have been providing input through the town and MassDOT on the long-range plans for the Route 20 corridor.

No-Build Traffic Volumes

The year 2026 No-Build conditions traffic volume networks were developed by applying a 1.0% annual growth rate over seven years to the 2019 Existing conditions traffic volume networks and adding the traffic volumes associated with the two-background development described above. Figures 9, 10, and 11 show the resulting 2026 No-Build conditions peak hour traffic volume networks for the weekday morning, weekday evening and Saturday midday peak hours, respectively.

[4] *Trip Generation Manual, 10th Edition*, Institute of Transportation Engineers, Washington, D.C., 2017.

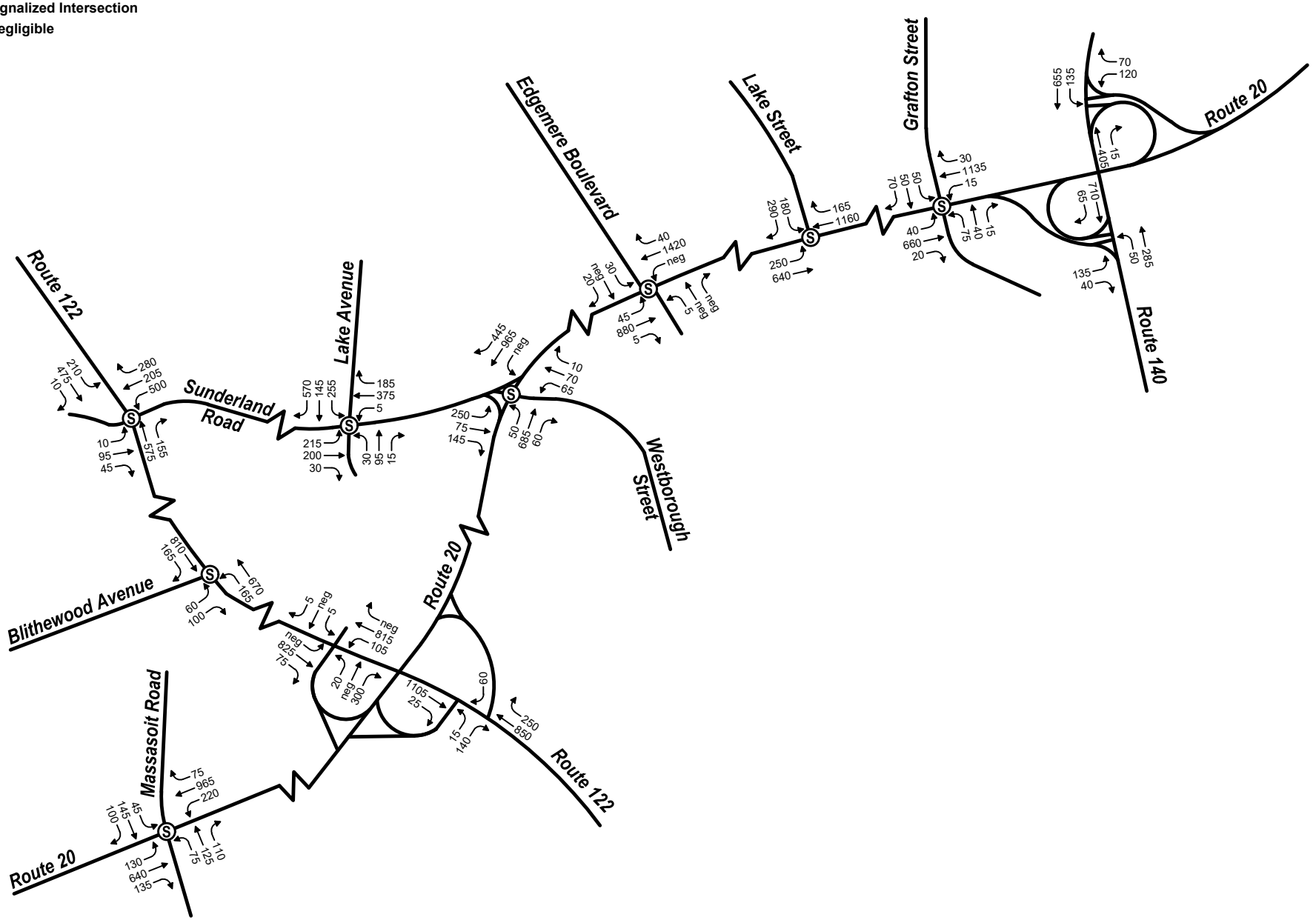
Ⓢ Signalized Intersection
neg = Negligible



Not to Scale

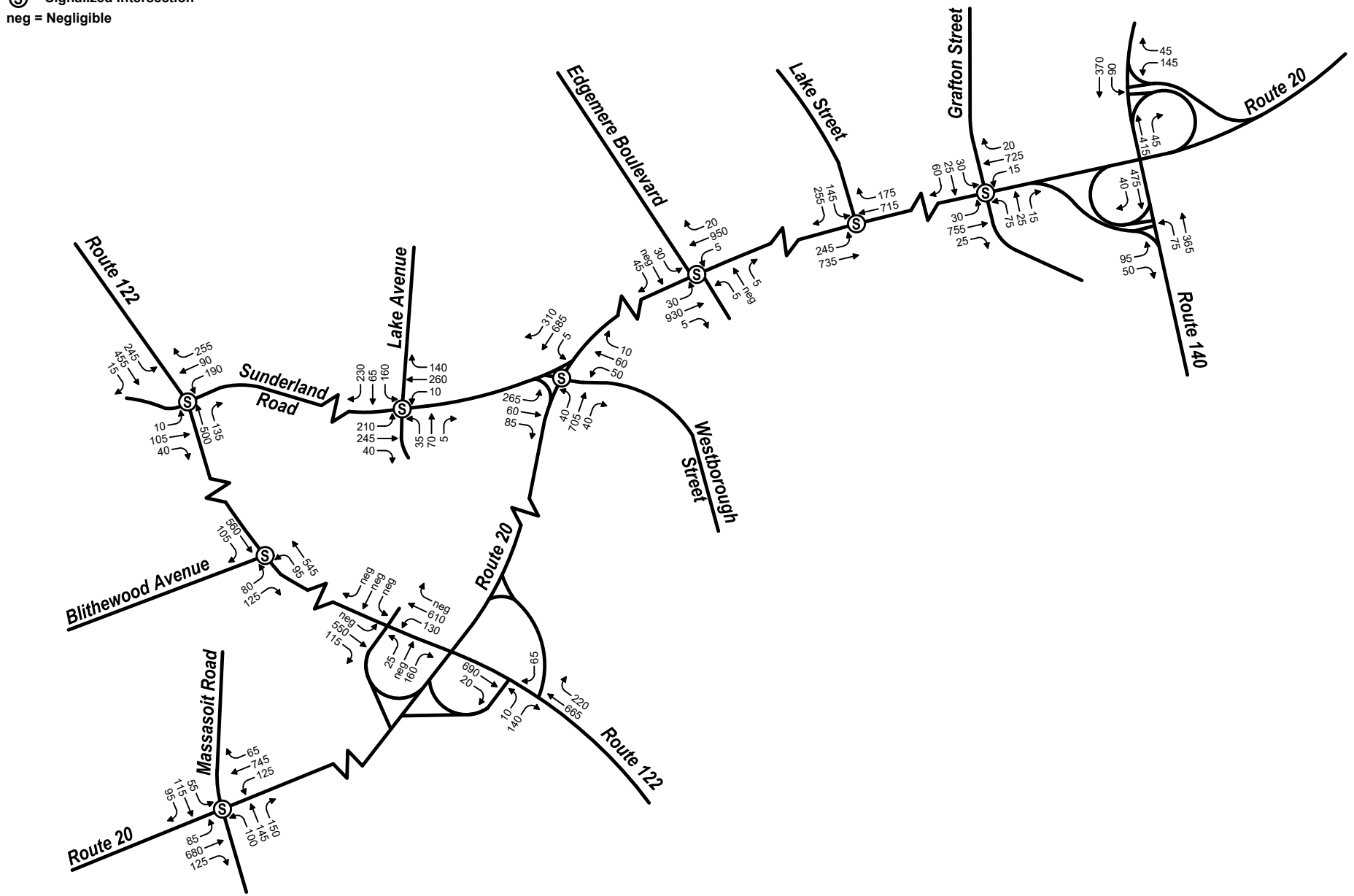
Figure 9
2026 No-Build Conditions
Weekday Morning Peak Hour Traffic Volumes
Edgemere Crossing at Flint Pond
Shrewsbury, Massachusetts

Ⓢ Signalized Intersection
neg = Negligible



Not to Scale

Figure 10
2026 No-Build Conditions
Weekday Evening Peak Hour Traffic Volumes
Edgemere Crossing at Flint Pond
Shrewsbury, Massachusetts



Not to Scale

Figure 11
2026 No-Build Conditions
Saturday Midday Peak Hour Traffic Volumes
Edgemere Crossing at Flint Pond
Shrewsbury, Massachusetts

Future Roadway Conditions

In assessing future traffic conditions, proposed roadway improvements within the study area were considered. Based on discussions with Town of Shrewsbury officials and from information available from MassDOT, there are two planned roadway improvement projects identified within the study area.

- **Shrewsbury – Intersection & Signal Improvement at US 20 (Hartford Turnpike) at Grafton Street (MassDOT Project #607764):** Improvements consist of intersection safety upgrades for signs, pavement markings (including the addition of an eastbound left turn only lane), and traffic signals. This work is intended to address some of the issues noted through the Road Safety Audit process completed in April 2015. The 25% design plans were completed in February 2018. MassDOT and their consultant is working with the VHB and the Proponent to coordinate the two highway elements. There is no specific date that construction is expected to begin for this project, but it is expected to be within the next several years. This roadway project is funded through the Statewide HSIP Program.
- **Shrewsbury – Resurfacing and Related Work on a Section of Route 20 (MassDOT Project #602102):** Improvements include milling and resurfacing with the widening of the existing roadway from two lanes to four lanes between Edgemere Boulevard and the Route 140 interchange (including the Route 140 interchange ramps). The total project length is 1.4 miles. As part of the proposed Flint Pond Mixed-Use Development project and as identified in the Mitigation section of this Study, the proponent is committed to extending these efforts along Route 20 to Lake Street.

Build Conditions

Build traffic volumes were determined by estimating Site-generated traffic volumes, distributing these volumes over the study area roadways, and adding to the 2026 No-Build traffic volumes. The Site generated traffic volumes include new trips that are projected to be generated by the Project.

Site-Generated Traffic Volumes

The rate at which a development generates traffic is dependent upon several factors such as size, location, and concentration of surrounding developments. As previously discussed, the Project consists of approximately an 80,000 SF Market Basket supermarket, 65,000 SF of general retail space, and 250 residential units. The general retail space would be comprised of approximately 13,000 SF of pharmacy space, a 2,000 SF drive-in bank, and 50,000 SF of other commercial space. Trip generation estimates for the proposed uses were projected using data published in the ITE Trip Generation Manual for Land Use Code (LUC) 850 (Supermarket), LUC 820 (Shopping Center), LUC 221 (Mid-Rise Multifamily Housing). The trip generation worksheets are included in the Appendix.

Shared Trips

Because the Project proposes a mix of uses, the trip generation characteristics of the Site will be different from a single-use project. Some of the traffic to be generated by the Project will be contained on Site as "internal" or "shared vehicle" trips. This concept means that some patrons could visit more than one of the uses on the site. For example, patrons of the supermarket may also visit the general retail on Site. While these shared trips represent new traffic to the individual uses, they would not show up as new vehicle trips on the surrounding roadway network. To account for shared trips between the proposed uses, the shared trip methodology outlined in the ITE Trip Generation Handbook, 2nd Edition[5] was applied. The shared trip calculations are included in the Appendix.

Pass-by Trips

Not all the trips generated by the Project will be new traffic that is added to the study area intersections and roadways. Retail uses typically attract a significant percentage of their traffic from the traffic streams passing the Site, particularly during peak periods. These trips, which are considered pass-by trips, are already on the roadway system traveling to and from locations other than the Site (such as home, work or other shopping destinations).

Pass-by trips are attracted to the Site as they pass through the area. The rate at which pass-by trips are attracted to a Site is highly dependent on the type of land use at that Site, the proximity of the Site to major traffic corridors, and the location and type of nearby land uses. ITE data shows pass-by rates for supermarkets of 36-percent during the weekday evening peak hour and pass-by rates for shopping centers of 34-percent during the weekday evening peak hour and 26-percent during the Saturday midday peak hour. Pass-by rates were assumed to be 25-percent for peak hours in which no data was available. Based on the MassDOT TIA Guidelines, pass-by trips should not account for more than 15-percent of an adjacent street traffic volume; the remaining "non-primary" trips come from existing traffic streams as diverted-link trips. Using the ITE pass-by rates does not result in the pass-by volumes exceeding 15-percent of the adjacent street traffic. As such, the unadjusted ITE rates were used for the projections. The pass-by trip calculations are included in the Appendix. The Project trip generation summary is provided in Table 3.

[5] *Trip Generation Handbook, 2nd Edition*, Institute of Transportation Engineers, Washington, D.C., June 2004.

Table 3 Trip Generation Summary

	Gross Residential Trips [1]	Gross Supermarket Trips [2]	Gross Retail Trips[3]	Shared Trips	Pass-by Trips [4]	Total New Trips
Weekday Daily						
Enter	680	3,442	1,735	482	1,234	4,141
Exit	680	3,442	1,735	482	1,234	4,141
Total	1,360	6,884	3,470	964	2,468	8,282
Weekday Morning						
Enter	22	183	62	1	51	215
Exit	62	122	38	1	51	170
Total	84	305	100	2	102	385
Weekday Evening						
Enter	65	338	154	48	166	343
Exit	42	325	167	48	166	320
Total	107	663	321	96	332	663
Saturday Daily						
Enter	589	7,105	2,515	418	2,353	7,438
Exit	589	7,105	2,515	418	2,353	7,438
Total	1,178	14,210	5,030	836	4,706	14,876
Saturday Midday						
Enter	55	388	194	49	137	451
Exit	57	373	179	49	137	423
Total	112	761	373	98	274	874

1 Trip generation estimate based on ITE LUC 221 (Multifamily Housing Mid-Rise)
2 Trip generation estimate based on ITE LUC 850 (Supermarket)
3 Trip generation estimate based on ITE LUC 820 (Shopping Center)
4 Pass-by trip rates based on ITE rates for LUC 850 (Supermarket) and LUC 820 (Shopping Center), 25-percent rate assumed for time periods with no available data

As shown in Table 3, the Project is estimated to generate approximately 385 new trips (215 entering/170 exiting) during the weekday morning peak hour, 663 new trips (343 entering/320 exiting) during the weekday evening peak hour, and 874 new trips (451 entering/423 exiting) during the Saturday midday peak hour.

In addition to the Project, trip generation estimates were completed for the As-of-Right alternative which includes 357,500 SF of general retail space and 80,000 SF of general office space. The estimate is included in the Appendix. This alternative was developed to demonstrate what could be constructed on the Project Site as-of-right under the existing zoning.

Trip Distribution

The directional distribution of the vehicular traffic approaching and departing the Site is a function of the land use, population densities, the location of employment, existing travel patterns, competing uses, and the efficiency of the existing roadway system.

The directional distribution of Site-generated traffic was developed using a gravity model based on population data from the 2010 U.S. Census and a review of the regional roadway network. Existing supermarket locations, which may serve as competition to the proposed Market Basket supermarket, were also considered. The distribution has been developed to consider that it would be unlikely for customers of competing supermarket uses to bypass a similar store to visit the proposed supermarket. Table 4 and Figures 12 and 13 show the anticipated Site-generated trip distribution for the residential and retail/supermarket uses, respectively. The census data is provided in the Appendix.

Table 4 Trip Distribution

		Percent Site Traffic	
Major Roadway	**Direction (From/To)**	**Residential**	**Retail/Supermarket**
Route 20	West	8%	14%
Massasoit Road	South	0%	3%
Route 122	South	10%	15%
Route 122	North	10%	10%
Lake Avenue	North	0%	8%
Lake Street	North	23%	5%
Route 140	North	19%	10%
Route 140	South	1%	10%
Route 20	East	29%	21%
Total		**100%**	**100%**

Build Traffic Volumes

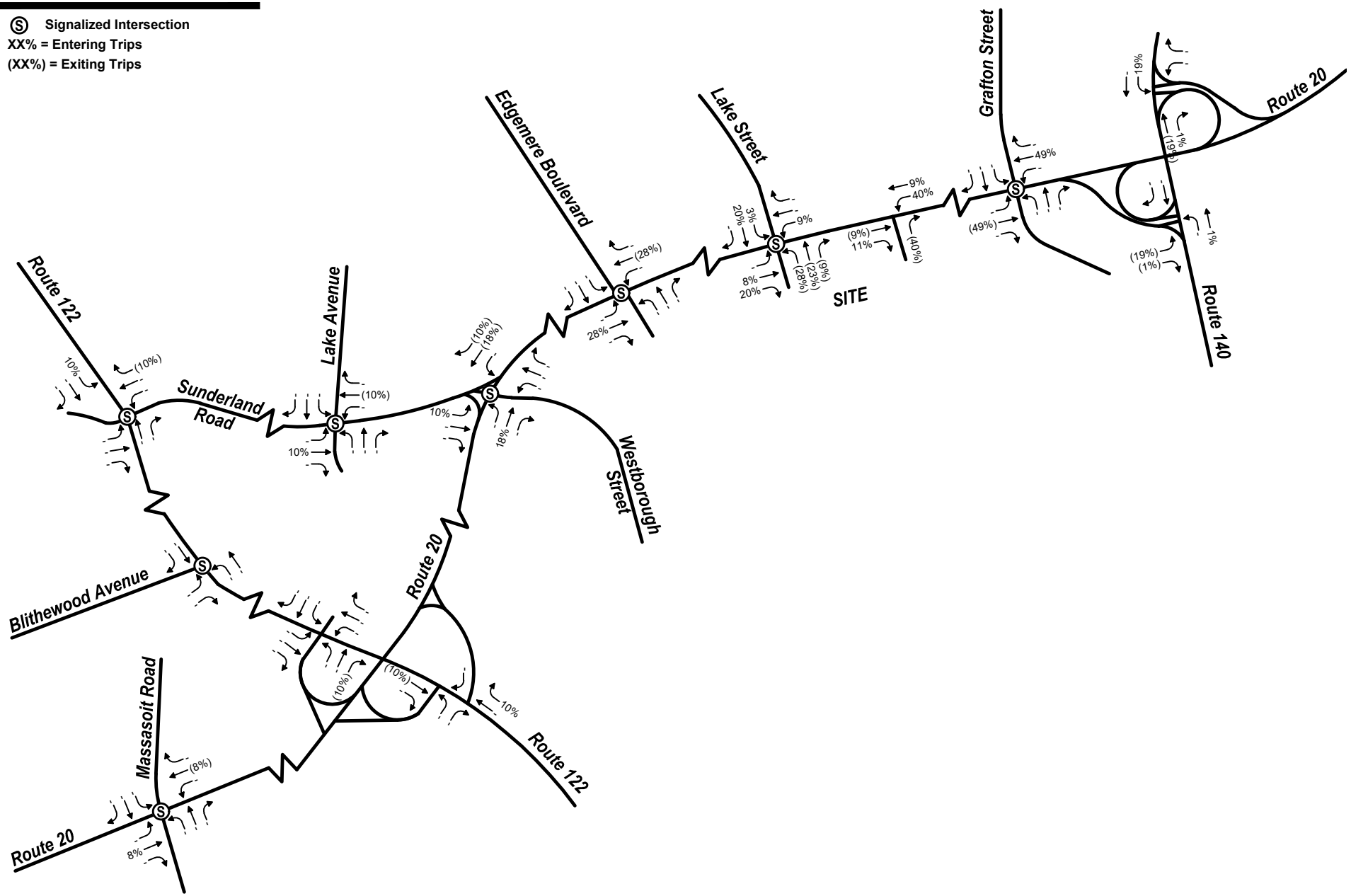
The Site-generated traffic volumes were assigned to the roadway network according to the distribution and travel patterns described above and added to the 2026 No-Build conditions traffic volumes. Figures 14, 15 and 16 show the resulting 2026 Build conditions peak hour traffic volume networks for the weekday morning, weekday evening, and Saturday midday peak hours, respectively.

Proposed Site Access

Access to the Site will be provided via an unsignalized right-out driveway along Route 20 in the general location of the existing driveway and a signalized full access driveway at the intersection of Lake Street and Route 20. Internal driveway connections between the retail, residential, and Market Basket supermarket parking areas will be provided.

Proposed Parking

Parking for the proposed Project is based on an evaluation of the likely demands at the Project Site, consideration of zoning requirements in the Town of Shrewsbury, and the



Not to Scale

Figure 12
Trip Distribution - Residential

Edgemere Crossing at Flint Pond
Shrewsbury, Massachusetts

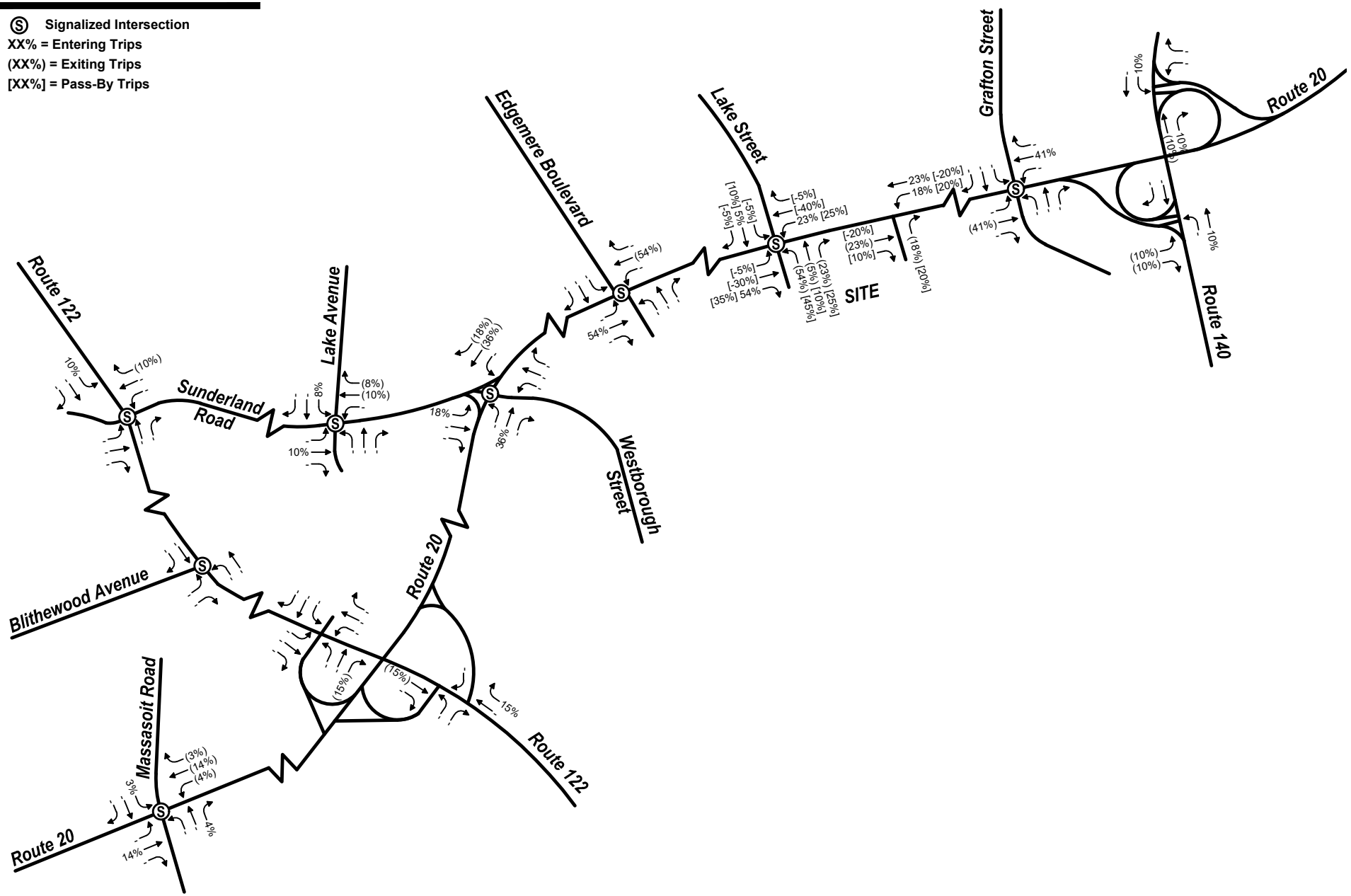


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Figure 13
Trip Distribution - Retail/Supermarket

Edgemere Crossing at Flint Pond
Shrewsbury, Massachusetts

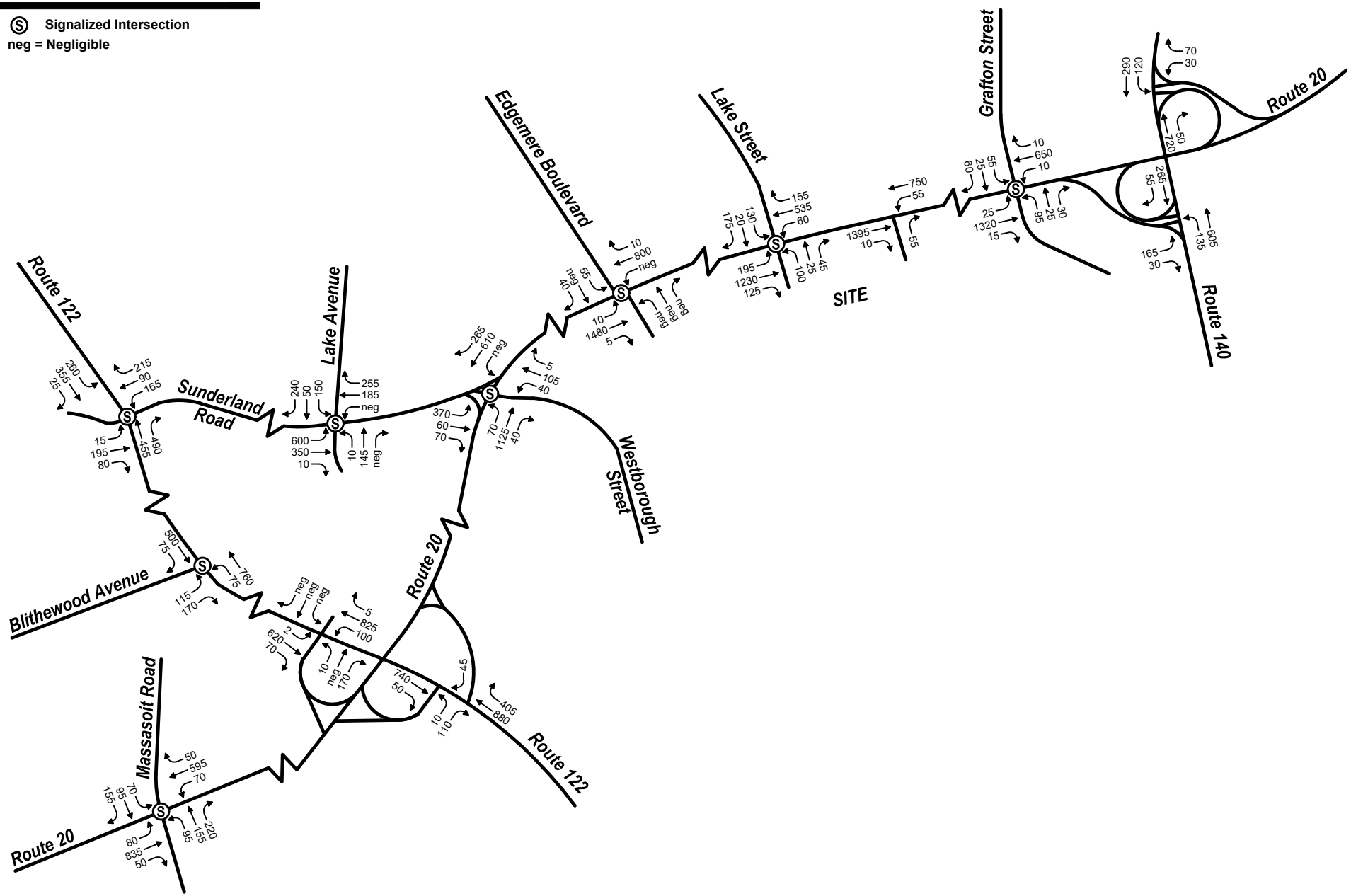

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Figure 14

2026 Build Conditions
Weekday Morning Peak Hour Traffic Volumes
Edgemere Crossing at Flint Pond
Shrewsbury, Massachusetts

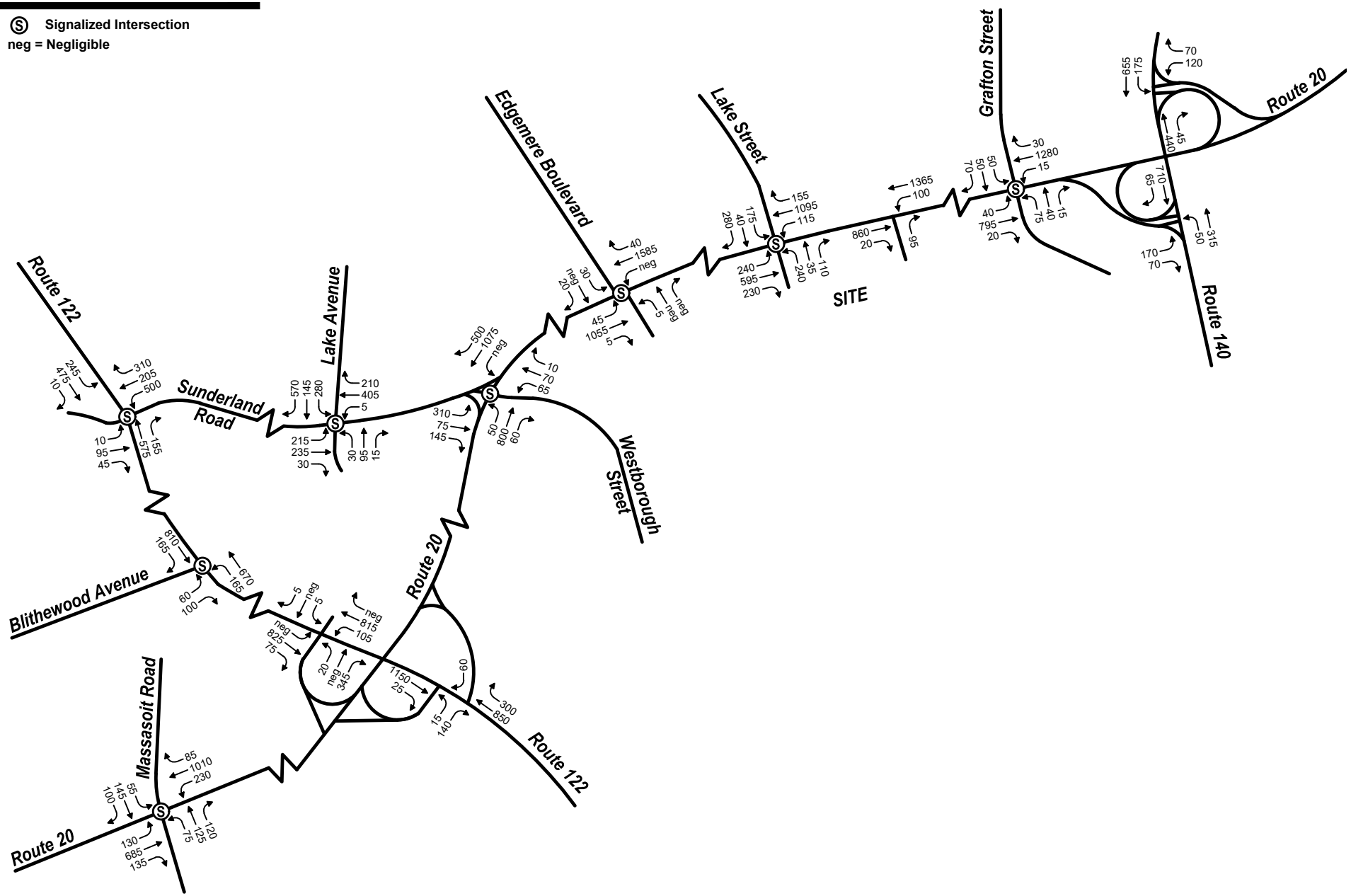

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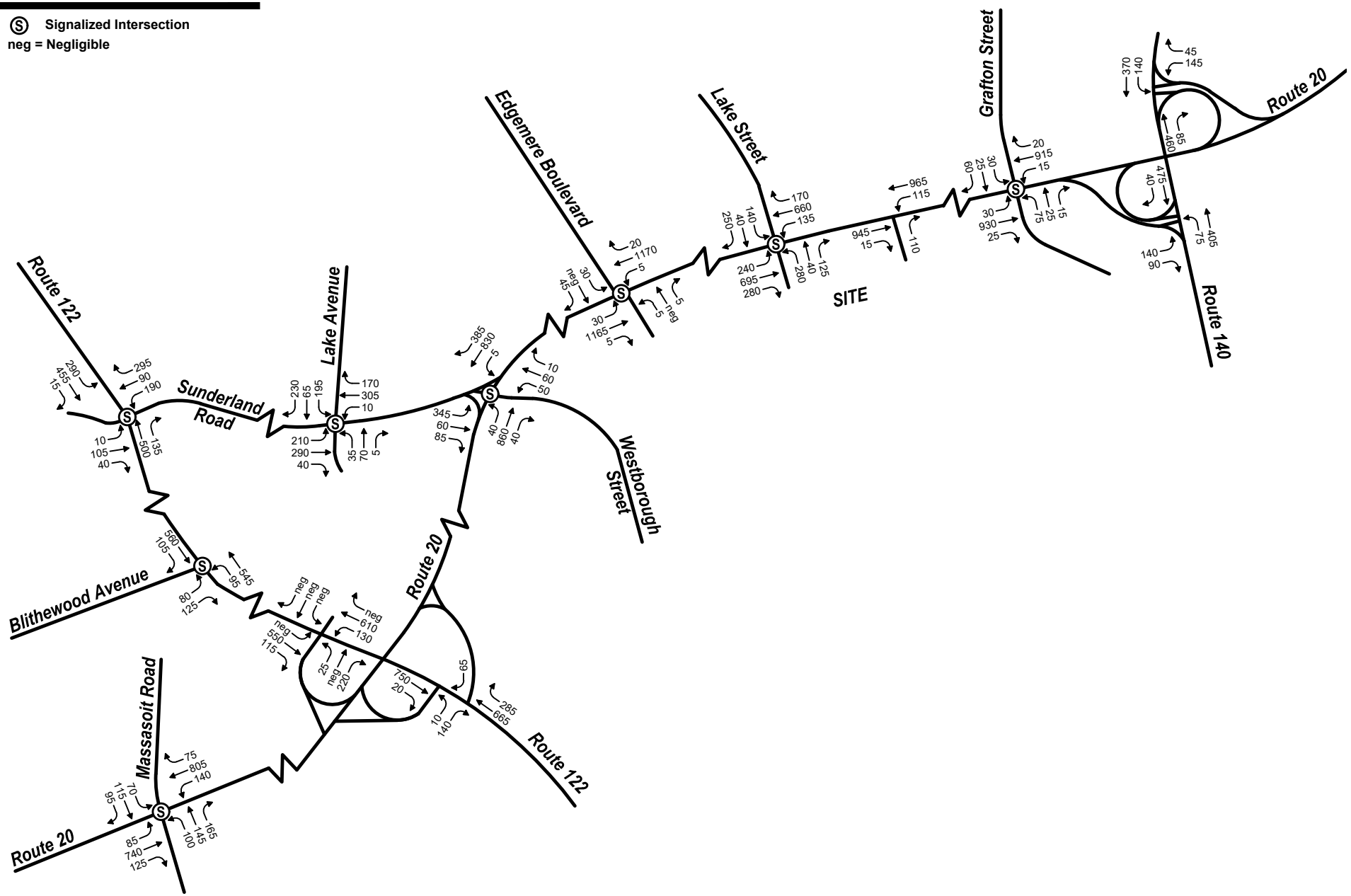
Figure 15
2026 Build Conditions
Weekday Evening Peak Hour Traffic Volumes
Edgemere Crossing at Flint Pond
Shrewsbury, Massachusetts



Not to Scale

Figure 16
2026 Build Conditions
Saturday Midday Peak Hour Traffic Volumes
Edgemere Crossing at Flint Pond
Shrewsbury, Massachusetts

physical layout of the Project Site. The number of spaces provided was generated, in part, based on rates provided in the ITE Parking Generation, 4th Edition[6] and Town of Shrewsbury Zoning Ordinance.

Based on the Proponent's experience in developing this type of retail development, the average parking ratio to support the Project during peak shopping periods is anticipated in the range of four spaces per 1,000 SF of supermarket and retail uses. Table 5 summarizes the parking requirements based on ITE, zoning, and the proposed parking supply to be provided.

Table 5 Parking Summary

	ITE [1]		Zoning [2]	Proposed Supply [3]
Land Use	**Weekday**	**Saturday**	**Weekday/ Saturday**	**Peak Weekday/ Saturday**
Supermarket	221	362	319	336
Retail	166	187	260	410
Residential	300	258	375	458
Total	**687**	**807**	**954**	**1,204**

1 Parking generation estimate based on LUC 850 (Supermarket), LUC 820 (Shopping Center), and LUC 221 (Multifamily Housing Mid-Rise)
2 Parking requirements based on the Town of Shrewsbury Zoning Ordinance
3 Proposed parking supply to be provided on the whole Project Site

As shown in Table 5, the parking estimate for the development based on ITE is 687 spaces on a weekday and 807 spaces on a Saturday. The required parking based on zoning is 954 spaces (250 units of apartments at 1.5 space/unit and 260ksf of retail space at 4.0 spaces/ksf). The project will be providing a total of 1,204 spaces which includes an average of 1.8 spaces per residential unit and an average of just over 5.1 spaces per thousand square feet of retail space on the site.

6 Parking Generation, 4th Edition, Institute of Transportation Engineers, Washington, D.C., 2010.

4

Traffic Operations Analysis

Measuring existing traffic volumes and projecting future traffic volumes quantifies traffic within the study area. To assess quality of flow, roadway capacity analyses were conducted with respect to 2019 Existing conditions and projected 2026 No-Build and Build traffic volume conditions. These analyses are included in the Appendix. Capacity analyses provide an indication of how well the roadway facilities serve the traffic demands placed on them. Calculated levels of service classify roadway operating conditions.

Level-of-Service Criteria

Level of service (LOS) is the term used to denote the different operating conditions that occur on a given roadway segment under various traffic volume loads. It is a qualitative measure that considers several factors including roadway geometry, speed, travel delay, freedom to maneuver, and safety. Level of service provides an index to the operational qualities of a roadway segment or an intersection. Level of service designations range from A to F, with LOS A representing the best operating conditions and LOS F representing the worst operating conditions.

For signalized intersections, the evaluation criteria used to analyze study area intersections are based on the percentile-delay method (SYNCHRO results). For unsignalized intersections, the analysis assumes that traffic on the mainline is not affected by traffic on the side streets. The level of service is only determined for left-turns from the main street and all movements

from the minor street. The evaluation criteria used to analyze unsignalized intersections are based on the 2010 Highway Capacity Manual (HCM)[7].

It should be noted that the analytical methodologies typically used for the analysis of unsignalized intersections use conservative analysis parameters such as high critical gaps. Actual field observations indicate that drivers on minor streets generally accept smaller gaps in traffic than those used in the analysis procedures and therefore experience less delay than reported by the analysis software. The net effect of these procedural limitations of the analysis software is the over-estimation of calculated delays at unsignalized intersections. Cautious judgment should therefore be exercised when interpreting the capacity analysis results at unsignalized intersections.

Intersection Capacity Analysis

Intersection capacity analyses were conducted at all intersections in the study area. Analyses were conducted for the 2019 Existing, 2026 No-Build, and 2026 Build conditions. Tables 6 and 7 summarize the capacity analyses for signalized and unsignalized intersections, respectively.

As shown in Tables 6 and 7, the addition of Project related trips is expected to have minor impacts at the study area intersections except for:

- Route 122 at Sunderland Road; and
- Sunderland Road at Lake Avenue/Southwest Commons Rear Driveway

[7] Transportation Research Board, Highway Capacity Manual, Washington, D.C., 2010.

Table 6 Signalized Intersection Capacity Analysis

Location / Movement	2019 Existing Conditions					2026 No-Build Conditions					2026 Build Conditions				
	v/c [a]	Del [b]	LOS [c]	50 Q [d]	95 Q [e]	v/c	Del	LOS	50 Q	95 Q	v/c	Del	LOS	50 Q	95 Q
1: Route 20 at Massasoit Road/Millbury Avenue															
Weekday Morning															
EB L	0.47	48	D	52	93	0.46	48	D	50	99	0.47	49	D	51	99
EB T/R	0.74	28	C	244	301	0.74	29	C	240	329	0.73	28	C	253	347
WB L	0.40	48	D	40	80	0.40	48	D	41	85	0.43	49	D	45	90
WB T	0.41	22	C	138	188	0.42	22	C	142	202	0.42	21	C	148	210
WB R	0.07	0	A	0	0	0.07	0	A	0	0	0.07	0	A	0	0
NB L/T	0.61	35	C	144	224	0.58	33	C	135	237	0.61	36	D	142	240
NB R	0.29	8	A	34	72	0.28	8	A	32	79	0.30	8	A	35	82
SB L/T	0.43	30	C	85	146	0.41	30	C	82	154	0.46	32	C	89	162
SB R	0.28	6	A	2	42	0.27	6	A	1	47	0.28	6	A	3	50
Total		**25**	**C**				**25**	**C**				**25**	**C**		
Weekday Evening															
EB L	0.55	47	D	73	138	0.58	49	D	80	150	0.59	51	D	82	150
EB T/R	0.75	32	C	211	277	0.76	32	C	228	297	0.77	32	C	248	321
WB L	0.66	44	D	124	214	0.68	46	D	133	#249	0.70	49	D	144	#266
WB T	0.74	28	C	256	331	0.74	27	C	274	358	0.74	27	C	293	381
WB R	0.11	2	A	0	13	0.11	2	A	0	14	0.12	3	A	0	20
NB L/T	0.54	36	D	106	189	0.60	40	D	115	213	0.66	44	D	120	#234
NB R	0.13	5	A	8	35	0.14	5	A	9	41	0.15	5	A	10	43
SB L/T	0.44	33	C	100	171	0.47	35	C	105	191	0.56	39	D	117	207
SB R	0.21	6	A	0	33	0.21	6	A	0	38	0.22	6	A	0	38
Total		**29**	**C**				**30**	**C**				**31**	**C**		
Saturday Midday															
EB L	0.42	50	D	42	126	0.49	55	D	51	136	0.51	57	E	56	136
EB T/R	0.74	33	C	185	400	0.80	37	D	233	#471	0.80	37	D	264	#549
WB L	0.52	50	D	61	172	0.60	56	E	75	#205	0.66	59	E	91	#240
WB T	0.56	28	C	166	372	0.62	30	C	202	422	0.68	32	C	223	465
WB R	0.10	1	A	0	3	0.11	2	A	0	9	0.12	3	A	0	18
NB L/T	0.59	38	D	104	#327	0.65	42	D	132	#395	0.72	48	D	151	#411
NB R	0.18	6	A	13	45	0.20	7	A	19	53	0.22	7	A	23	57
SB L/T	0.37	33	C	65	202	0.43	36	D	85	231	0.56	42	D	107	#283
SB R	0.18	5	A	0	30	0.19	6	A	0	37	0.19	6	A	0	37
Total		**30**	**C**				**33**	**C**				**35**	**C**		

a Volume to capacity ratio.
b Average total delay, in seconds per vehicle.
c Level-of-service.
d 50th percentile queue, in feet.
e 95th percentile queue, in feet.
~ Volume exceeds capacity, queue is theoretically infinite.
# 95th percentile volume exceeds capacity, queue may be longer.

Table 6 Signalized Intersection Capacity Analysis (continued)

Location / Movement	2019 Existing Conditions					2026 No-Build Conditions					2026 Build Conditions				
	v/c [a]	Del [b]	LOS [c]	50 Q [d]	95 Q [e]	v/c	Del	LOS	50 Q	95 Q	v/c	Del	LOS	50 Q	95 Q
5: Route 122 at Blithewood Avenue															
Weekday Morning															
EB L	0.40	30	C	34	118	0.41	32	C	35	134	0.41	32	C	35	134
EB R	0.26	5	A	0	37	0.26	5	A	0	50	0.26	5	A	0	50
NB L	0.18	7	A	8	38	0.19	7	A	8	40	0.19	7	A	8	40
NB T	0.75	15	B	148	492	0.74	15	B	151	535	0.74	15	B	151	535
SB T	0.71	22	C	120	344	0.73	22	C	135	380	0.73	22	C	135	380
SB R	0.12	4	A	0	25	0.12	4	A	0	25	0.12	4	A	0	25
Total		**16**	**B**				**16**	**B**				**16**	**B**		
Weekday Evening															
EB L	0.30	37	D	24	75	0.37	43	D	32	81	0.37	43	D	32	81
EB R	0.22	7	A	0	34	0.21	7	A	0	41	0.21	7	A	0	41
NB L	0.41	8	A	14	68	0.53	13	B	16	95	0.53	13	B	16	95
NB T	0.47	7	A	90	338	0.53	8	A	104	390	0.53	8	A	104	390
SB T	0.74	20	B	213	#618	0.80	22	C	299	#816	0.80	22	C	299	#816
SB R	0.17	4	A	4	41	0.19	4	A	9	52	0.19	4	A	9	52
Total		**13**	**B**				**15**	**B**				**15**	**B**		
Saturday Midday															
EB L	0.35	32	C	26	95	0.33	33	C	25	102	0.33	33	C	25	102
EB R	0.22	6	A	0	32	0.21	6	A	0	45	0.21	6	A	0	45
NB L	0.22	6	A	8	45	0.24	6	A	9	47	0.24	6	A	9	47
NB T	0.46	8	A	68	267	0.49	8	A	76	297	0.49	8	A	76	297
SB T	0.69	20	B	140	401	0.70	20	B	145	432	0.70	20	B	145	432
SB R	0.15	3	A	0	27	0.14	3	A	0	29	0.14	3	A	0	29
Total		**13**	**B**				**13**	**B**				**13**	**B**		

a Volume to capacity ratio.
b Average total delay, in seconds per vehicle.
c Level-of-service.
d 50th percentile queue, in feet.
e 95th percentile queue, in feet.

~ Volume exceeds capacity, queue is theoretically infinite.
# 95th percentile volume exceeds capacity, queue may be longer.

Table 6 Signalized Intersection Capacity Analysis (continued)

Location / Movement	2019 Existing Conditions					2026 No-Build Conditions					2026 Build Conditions				
	v/c [a]	Del [b]	LOS [c]	50 Q [d]	95 Q [e]	v/c	Del	LOS	50 Q	95 Q	v/c	Del	LOS	50 Q	95 Q
6: Route 122 at Sunderland Road															
Weekday Morning															
EB L/T/R	>1.20	>120	F	~171	#430	>1.20	>120	F	~169	#458	>1.20	>120	F	~170	#458
WB L	0.53	27	C	52	143	0.55	28	C	56	152	0.55	28	C	56	152
WB T/R	0.50	17	B	59	184	0.53	18	B	66	202	0.56	19	B	70	212
NB T	0.75	34	C	162	#482	0.84	40	D	191	#557	0.84	40	D	191	#557
NB R	0.61	10	B	32	174	0.68	13	B	51	#247	0.68	13	B	51	#247
SB L	0.67	26	C	52	#237	0.83	39	D	57	#281	0.90	49	D	63	#316
SB T/R	0.44	17	B	94	290	0.47	17	B	103	312	0.47	17	B	103	312
Total		**45**	**D**				**46**	**D**				**47**	**D**		
Weekday Evening															
EB L/T/R	0.91	88	F	91	#245	>1.20	>120	F	~114	#307	>1.20	>120	F	~144	#337
WB L	>1.20	>120	F	~323	#711	>1.20	>120	F	~387	#796	>1.20	>120	F	~387	#796
WB T/R	0.86	47	D	230	#562	0.96	62	E	272	#654	1.02	74	E	296	#706
NB T	0.72	32	C	256	#591	0.81	37	D	307	#715	0.81	37	D	307	#715
NB R	0.21	7	A	10	61	0.23	8	A	16	76	0.23	8	A	16	76
SB L	0.59	21	C	51	#155	0.78	35	C	58	#257	0.91	53	D	79	#328
SB T/R	0.47	17	B	152	375	0.51	17	B	168	414	0.51	17	B	168	414
Total		**68**	**E**				**92**	**F**				**113**	**F**		
Saturday Midday															
EB L/T/R	0.73	51	D	69	#205	0.71	49	D	65	#223	0.71	49	D	65	#224
WB L	0.56	28	C	62	162	0.57	28	C	65	173	0.57	28	C	65	173
WB T/R	0.58	19	B	74	215	0.60	19	B	79	236	0.66	20	C	88	265
NB T	0.80	37	D	191	#548	0.87	43	D	216	#610	0.87	43	D	216	#610
NB R	0.21	5	A	0	40	0.23	6	A	1	49	0.23	6	A	1	49
SB L	0.76	33	C	52	#247	0.91	55	E	63	#315	1.09	99	F	~100	#392
SB T/R	0.51	18	B	124	360	0.55	19	B	139	397	0.55	19	B	139	397
Total		**27**	**C**				**31**	**C**				**38**	**D**		

a Volume to capacity ratio.
b Average total delay, in seconds per vehicle.
c Level-of-service.
d 50th percentile queue, in feet.
e 95th percentile queue, in feet.
~ Volume exceeds capacity, queue is theoretically infinite.
# 95th percentile volume exceeds capacity, queue may be longer.

Table 6 Signalized Intersection Capacity Analysis (continued)

Location / Movement	2019 Existing Conditions					2026 No-Build Conditions					2026 Build Conditions				
	v/c [a]	Del [b]	LOS [c]	50 Q [d]	95 Q [e]	v/c	Del	LOS	50 Q	95 Q	v/c	Del	LOS	50 Q	95 Q
7: Sunderland Road at Lake Avenue/Southwest Commons Rear Driveway															
Weekday Morning															
EB L	>1.20	>120	F	~524	#744	>1.20	>120	F	~582	#799	>1.20	>120	F	~592	#799
EB T	1.00	88	F	~182	#361	1.11	118	F	~232	#405	1.18	>120	F	~262	#434
EB R	0.03	0	A	0	0	0.03	0	A	0	0	0.03	0	A	0	0
WB L	0.00	31	C	1	5	0.00	31	C	1	5	0.00	31	C	1	5
WB T	0.67	48	D	90	155	0.69	49	D	97	166	0.72	50	D	107	#191
WB R	0.57	10	B	0	64	0.58	10	B	0	66	0.61	12	B	10	82
NB L	0.08	39	D	6	22	0.08	39	D	6	22	0.08	39	D	6	22
NB T/R	0.26	22	C	64	114	0.25	22	C	63	112	0.25	23	C	64	112
SB L	0.73	61	E	75	#168	0.77	66	E	81	#182	0.86	79	E	92	#206
SB T	0.06	14	B	13	41	0.06	15	B	15	44	0.06	15	B	15	44
SB R	0.28	3	A	0	45	0.29	3	A	0	48	0.29	3	A	0	48
Total		**>120**	**F**				**>120**	**F**				**>120**	**F**		
Weekday Evening															
EB L	0.78	63	E	137	#299	0.79	63	E	146	#323	0.75	59	E	146	#323
EB T	0.69	56	E	122	#245	0.72	57	E	133	#283	0.81	63	E	160	#360
EB R	0.09	1	A	0	0	0.09	1	A	0	0	0.09	1	A	0	0
WB L	0.02	40	D	3	16	0.01	40	D	3	16	0.01	40	D	3	16
WB T	1.09	116	F	~282	#572	1.14	>120	F	~308	#648	>1.20	>120	F	~360	#707
WB R	0.47	20	B	35	112	0.49	21	C	40	134	0.56	25	C	57	165
NB L	0.26	55	D	21	61	0.26	55	E	21	61	0.26	56	E	21	61
NB T/R	0.20	27	C	51	126	0.20	27	C	52	126	0.20	28	C	53	126
SB L	>1.20	>120	F	~216	#474	>1.20	>120	F	~261	#532	>1.20	>120	F	~304	#583
SB T	0.19	26	C	63	151	0.21	26	C	70	164	0.21	26	C	72	164
SB R	0.57	5	A	0	96	0.61	6	A	0	101	0.61	6	A	0	101
Total		**71**	**E**				**84**	**F**				**104**	**F**		
Saturday Midday															
EB L	0.71	54	D	110	#279	0.78	59	E	123	#317	0.78	59	E	123	#317
EB T	0.80	60	E	127	#325	0.90	74	E	147	#381	1.07	112	F	~185	#466
EB R	0.10	1	A	0	0	0.11	1	A	0	0	0.11	1	A	0	0
WB L	0.04	38	D	5	25	0.04	38	D	5	25	0.04	38	D	5	25
WB T	0.82	62	E	135	#346	0.94	80	F	158	#407	1.11	>120	F	~207	#491
WB R	0.36	9	A	0	48	0.41	11	B	3	63	0.50	16	B	19	97
NB L	0.36	49	D	29	56	0.26	48	D	21	61	0.26	48	D	21	61
NB T/R	0.19	25	C	43	79	0.13	25	C	30	84	0.13	25	C	30	84
SB L	0.84	79	E	87	#253	0.94	97	F	98	#286	1.15	>120	F	~136	#355
SB T	0.09	24	C	23	71	0.10	23	C	26	76	0.10	23	C	26	76
SB R	0.31	5	A	0	59	0.31	5	A	0	60	0.31	5	A	0	60
Total		**42**	**D**				**51**	**D**				**74**	**E**		

a Volume to capacity ratio.
b Average total delay, in seconds per vehicle.
c Level-of-service.
d 50th percentile queue, in feet.
e 95th percentile queue, in feet.
~ Volume exceeds capacity, queue is theoretically infinite.
# 95th percentile volume exceeds capacity, queue may be longer.

Table 6 Signalized Intersection Capacity Analysis (continued)

Location / Movement	2019 Existing Conditions					2026 No-Build Conditions					2026 Build Conditions				
	v/c [a]	Del [b]	LOS [c]	50 Q [d]	95 Q [e]	v/c	Del	LOS	50 Q	95 Q	v/c	Del	LOS	50 Q	95 Q
8: Route 20 at Sunderland Road/Westborough Road															
Weekday Morning															
EB L	0.71	45	D	140	209	0.71	45	D	141	#244	0.74	46	D	152	#271
EB T/R	0.71	42	D	129	197	0.70	42	D	128	#220	0.73	44	D	143	#261
WB L/T/R	0.77	60	E	105	#144	0.68	52	D	88	#172	0.68	53	D	88	#172
NB L/T/R	0.93	38	D	328	#480	1.00	53	D	~384	#535	1.11	87	F	~465	#600
SB L/T	0.43	18	B	109	153	0.47	19	B	124	172	0.52	20	B	139	191
SB R	0.15	0	A	0	0	0.17	0	A	0	0	0.19	0	A	0	0
Total		**33**	**C**				**39**	**D**				**54**	**D**		
Weekday Evening															
EB L	0.65	42	D	115	193	0.69	44	D	134	220	0.80	51	D	169	#305
EB T/R	0.69	36	D	105	190	0.71	37	D	117	#210	0.72	39	D	129	#246
WB L/T/R	0.69	52	D	94	138	0.67	52	D	85	#166	0.68	52	D	85	#166
NB L/T/R	0.66	22	C	176	245	0.78	27	C	213	296	0.96	46	D	278	#424
SB L/T	0.64	21	C	216	286	0.71	23	C	248	324	0.80	27	C	292	379
SB R	0.27	0	A	0	0	0.30	1	A	0	0	0.34	1	A	0	0
Total		**23**	**C**				**25**	**C**				**32**	**C**		
Saturday Midday															
EB L	0.62	40	D	107	182	0.67	43	D	123	205	0.73	45	D	151	#269
EB T/R	0.58	34	C	88	161	0.62	36	D	102	180	0.69	41	D	134	#243
WB L/T/R	0.58	45	D	72	115	0.59	47	D	68	126	0.60	48	D	68	126
NB L/T/R	0.58	19	B	152	222	0.62	20	C	189	255	0.77	26	C	251	334
SB L/T	0.46	18	B	121	177	0.50	18	B	155	209	0.62	21	C	202	266
SB R	0.18	0	A	0	0	0.21	0	A	0	0	0.26	0	A	0	0
Total		**21**	**C**				**22**	**C**				**25**	**C**		
9: Route 20 at Edgemere Boulevard/Parking Lot															
Weekday Morning															
EB L/T/R	0.56	4	A	78	153	0.62	5	A	94	184	0.67	5	A	108	214
WB L/T/R	0.38	10	A	95	155	0.45	11	B	117	184	0.50	12	B	134	210
NB L/T/R	0.02	0	A	0	0	0.02	0	A	0	0	0.02	0	A	0	0
SB L/T/R	0.53	22	C	5	48	0.56	24	C	8	55	0.56	24	C	8	55
Total		**7**	**A**				**8**	**A**				**8**	**A**		
Weekday Evening															
EB L/T/R	0.39	3	A	36	61	0.46	3	A	45	68	0.56	4	A	58	87
WB L/T/R	0.65	10	B	202	315	0.71	12	B	258	387	0.83	18	B	365	#608
NB L/T/R	0.06	1	A	0	0	0.04	0	A	0	0	0.04	0	A	0	0
SB L/T/R	0.39	13	B	0	15	0.33	9	A	0	18	0.34	10	A	0	18
Total		**8**	**A**				**9**	**A**				**12**	**B**		
Saturday Midday															
EB L/T/R	0.40	5	A	41	194	0.44	5	A	46	215	0.54	6	A	65	294
WB L/T/R	0.44	11	B	101	283	0.51	12	B	132	350	0.65	16	B	203	501
NB L/T/R	0.09	1	A	0	0	0.06	1	A	0	0	0.06	1	A	0	0
SB L/T/R	0.50	20	C	1	35	0.47	18	B	0	42	0.47	19	B	0	43
Total		**8**	**A**				**9**	**A**				**11**	**B**		

a Volume to capacity ratio.
b Average total delay, in seconds per vehicle.
c Level-of-service.
d 50th percentile queue, in feet.
e 95th percentile queue, in feet.
~ Volume exceeds capacity, queue is theoretically infinite.
# 95th percentile volume exceeds capacity, queue may be longer.

Table 6 Signalized Intersection Capacity Analysis (continued)

Location / Movement	2019 Existing Conditions					2026 No-Build Conditions					2026 Build Conditions				
	v/c [a]	Del [b]	LOS [c]	50 Q [d]	95 Q [e]	v/c	Del	LOS	50 Q	95 Q	v/c	Del	LOS	50 Q	95 Q
10: Route 20 at Lake Street/Site Driveway (west)															
Weekday Morning															
EB L	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.70	48	D	118	191
EB L/T	0.81	12	B	176	280	0.88	17	B	195	#346	n/a	n/a	n/a	n/a	n/a
EB T/R	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.77	18	B	322	420
WB L	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.53	59	E	38	#94
WB T/R	0.34	8	A	96	149	0.38	9	A	112	173	0.56	19	B	152	215
NB L	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.52	42	D	55	103
NB T/R	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.44	28	C	15	59
SB L	0.69	69	E	101	156	0.69	68	E	105	173	0.58	44	D	73	#156
SB R (SB T/R for Build)	0.56	13	B	0	52	0.55	13	B	0	67	0.70	22	C	12	#100
Total		**14**	**B**				**17**	**B**				**24**	**C**		
Weekday Evening															
EB L	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.93	78	E	153	#299
EB L/T	0.61	9	A	78	134	1.01dl	14	B	108	178	n/a	n/a	n/a	n/a	n/a
EB T/R	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.56	18	B	179	243
WB L	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.63	54	D	71	127
WB T/R	0.55	11	B	234	361	0.64	14	B	308	466	0.91	34	C	377	#527
NB L	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.97	83	F	138	#255
NB T/R	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.63	28	C	31	#100
SB L	0.73	67	E	129	208	0.77	69	E	148	233	0.83	62	E	96	#176
SB R (SB T/R for Build)	0.73	26	C	58	159	0.80	35	D	98	207	1.05	79	E	~90	#263
Total		**16**	**B**				**20**	**B**				**43**	**D**		
Saturday Midday															
EB L	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.76	51	D	147	#262
EB L/T	0.56	7	A	80	134	0.68	10	A	106	175	n/a	n/a	n/a	n/a	n/a
EB T/R	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.75	26	C	263	343
WB L	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.71	59	E	85	#172
WB T/R	0.36	8	A	114	182	0.42	9	A	153	230	0.79	33	C	244	321
NB L	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.73	39	D	148	#239
NB T/R	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.47	19	B	35	96
SB L	0.69	67	E	103	172	0.71	68	E	118	191	0.54	35	C	63	113
SB R (SB T/R for Build)	0.62	13	B	0	76	0.63	12	B	0	79	0.78	29	C	78	#198
Total		**12**	**B**				**14**	**B**				**33**	**C**		

a Volume to capacity ratio.
b Average total delay, in seconds per vehicle.
c Level-of-service.
d 50th percentile queue, in feet.
e 95th percentile queue, in feet.
~ Volume exceeds capacity, queue is theoretically infinite.
# 95th percentile volume exceeds capacity, queue may be longer.
dl De facto left turn lane.

Table 6 Signalized Intersection Capacity Analysis (continued)

Location / Movement	2019 Existing Conditions					2026 No-Build Conditions					2026 Build Conditions				
	v/c [a]	Del [b]	LOS [c]	50 Q [d]	95 Q [e]	v/c	Del	LOS	50 Q	95 Q	v/c	Del	LOS	50 Q	95 Q
11: Route 20 at Grafton Street															
Weekday Morning															
EB L	n/a	n/a	n/a	n/a	n/a	0.06	8	A	5	17	0.07	8	A	5	17
EB T/R (L/T/R for Existing)	0.69	14	B	215	314	0.73	15	B	231	355	0.75	15	B	256	393
WB L/T/R	0.36	9	A	74	109	0.45	15	B	81	190	0.50	16	B	98	226
NB L/T/R	0.49	30	C	63	122	0.53	34	C	65	150	0.56	37	D	71	150
SB L/T/R	0.45	24	C	48	95	0.50	30	C	52	130	0.52	32	C	57	131
Total		**14**	**B**				**17**	**B**				**18**	**B**		
Weekday Evening															
EB L	n/a	n/a	n/a	n/a	n/a	0.17	8	A	8	23	0.20	9	A	8	23
EB T/R (L/T/R for Existing)	0.42	9	A	88	126	0.36	9	A	91	151	0.43	9	A	114	188
WB L/T/R	0.60	11	B	176	237	0.73	21	C	306	467	0.82	24	C	370	#617
NB L/T/R	0.45	30	C	59	104	0.59	43	D	73	136	0.59	43	D	73	136
SB L/T/R	0.45	24	C	57	113	0.63	38	D	89	161	0.62	39	D	86	157
Total		**13**	**B**				**20**	**B**				**21**	**C**		
Saturday Midday															
EB L	n/a	n/a	n/a	n/a	n/a	0.09	7	A	5	18	0.11	7	A	5	17
EB T/R (L/T/R for Existing)	0.42	9	A	100	139	0.47	10	A	90	158	0.51	9	A	123	203
WB L/T/R	0.38	9	A	90	126	0.62	18	B	143	236	0.65	17	B	200	313
NB L/T/R	0.44	29	C	61	91	0.43	30	C	44	108	0.47	35	D	54	118
SB L/T/R	0.31	17	B	29	67	0.37	22	C	31	89	0.41	27	C	39	98
Total		**11**	**B**				**15**	**B**				**15**	**B**		

a Volume to capacity ratio.
b Average total delay, in seconds per vehicle.
c Level-of-service.
d 50th percentile queue, in feet.
e 95th percentile queue, in feet.

~ Volume exceeds capacity, queue is theoretically infinite.
# 95th percentile volume exceeds capacity, queue may be longer.

Table 7 Unsignalized Intersection Capacity Analysis

Location / Movement	2019 Existing Condition					2026 No-Build Conditions					2026 Build Conditions				
	D [a]	v/c [b]	Del [c]	LOS [d]	95 Q [e]	D	v/c	Del	LOS	95 Q	D	v/c	Del	LOS	95 Q
2: Route 122 at Route 20 EB Ramps (east)															
Weekday Morning															
EB L	5	0.01	13	B	0	5	0.01	14	B	0	5	0.01	14	B	0
SB L/R	40	0.20	24	C	18	45	0.22	26	D	20	45	0.23	27	D	23
Weekday Evening															
EB L	2	0.00	11	B	0	2	0.00	11	B	0	2	0.00	11	B	0
SB L/R	55	0.28	23	C	28	60	0.27	25	C	28	60	0.28	26	D	28
Saturday Midday															
EB L	2	0.00	10	A	0	2	0.00	10	A	0	2	0.00	10	B	0
SB L/R	60	0.17	16	C	15	65	0.20	17	C	18	65	0.21	18	C	20
3: Route 122 at Route 20 EB Ramps (west)															
Weekday Morning															
WB L	5	0.01	9	A	0	5	0.01	10	A	0	5	0.01	10	A	0
NB L/R	110	0.42	25	D	50	120	0.49	31	D	63	120	0.50	32	D	65
Weekday Evening															
WB L	5	0.01	11	B	0	5	0.01	11	B	0	5	0.01	12	B	0
NB L/R	135	0.74	61	F	123	155	1.03	>120	F	208	155	1.10	>120	F	225
Saturday Midday															
WB L	1	0.00	9	A	0	1	0.00	9	A	0	1	0.00	10	A	0
NB L/R	130	0.42	22	C	53	150	0.47	24	C	60	150	0.52	28	D	70
4: Route 122 at Route 20 WB Ramps/Davis Driveway															
Weekday Morning															
EB L	2	0.00	10	A	0	2	0.00	10	A	0	2	0.00	10	A	0
WB L	95	0.12	10	A	10	100	0.14	10	B	13	100	0.14	10	B	13
NB L/T/R	150	0.59	35	D	88	160	0.71	50	E	120	180	0.77	55	F	143
SB L/T/R	0	0.00	0	A	0	0	0.00	0	A	0	0	0.00	0	A	0
Weekday Evening															
EB L	0	0.00	0	A	0	0	0.00	0	A	0	0	0.00	0	A	0
WB L	100	0.14	11	B	13	105	0.17	11	B	15	105	0.17	11	B	15
NB L/T/R	300	>1.20	>120	F	445	320	>1.20	>120	F	658	365	>1.20	>120	F	775
SB L/T/R	10	>1.20	>120	F	85	10	>1.20	>120	F	*	10	>1.20	>120	F	*
Saturday Midday															
EB L	1	0.00	9	A	0	1	0.00	9	A	0	1	0.00	9	A	0
WB L	120	0.14	10	A	13	130	0.17	10	B	15	130	0.17	10	B	15
NB L/T/R	175	0.74	48	E	135	185	0.81	61	F	155	245	0.95	83	F	230
SB L/T/R	1	0.01	12	B	0	1	0.00	13	B	0	1	0.00	13	B	0

a Demand.
b Volume to capacity ratio.
c Average total delay, in seconds per vehicle.
d Level-of-service.
e 95th percentile queue, in feet.
* Error, Synchro cannot calculate delay and/or queue.

Table 7 Unsignalized Intersection Capacity Analysis (continued)

Location / Movement	2019 Existing Condition					2026 No-Build Conditions					2026 Build Conditions				
	D [a]	v/c [b]	Del [c]	LOS [d]	95 Q [e]	D	v/c	Del	LOS	95 Q	D	v/c	Del	LOS	95 Q
14: Route 20 at Site Driveway (east)															
Weekday Morning															
WB L											55	0.14	15	B	13
NB R											55	0.17	17	C	15
Weekday Evening	*Intersection does not exist under Existing Conditions*					*Intersection does not exist under No-Build Conditions*									
WB L											100	0.15	11	B	13
NB R											95	0.19	13	B	18
Saturday Midday															
WB L											115	0.19	12	B	18
NB R											110	0.24	14	B	23
12: Route 140 at Route 20 EB Ramps															
Weekday Morning															
EB L/R	150	0.90	86	F	183	160	0.93	100	F	183	195	1.15	>120	F	270
NB L	125	0.11	8	A	10	135	0.12	8	A	10	135	0.12	8	A	10
Weekday Evening															
EB L/R	160	0.92	80	F	205	175	0.82	65	F	155	240	1.11	>120	F	293
NB L	45	0.06	9	A	5	50	0.07	10	A	5	50	0.07	10	A	5
Saturday Midday															
EB L/R	130	0.55	28	D	80	145	0.50	27	D	65	230	0.78	47	E	158
NB L	70	0.08	9	A	5	75	0.08	9	A	8	75	0.08	9	A	8
13: Route 140 at Route 20 WB Ramps															
Weekday Morning															
WB L/R	95	0.23	13	B	23	100	0.22	14	B	20	100	0.26	17	C	25
SB L	85	0.12	10	B	10	95	0.13	10	B	13	120	0.17	11	B	15
Weekday Evening															
WB L/R	175	1.00	115	F	210	190	>1.20	>120	F	285	190	>1.20	>120	F	380
SB L	120	0.13	9	A	10	135	0.14	9	A	13	175	0.19	9	A	18
Saturday Midday															
WB L/R	175	0.62	34	D	98	190	0.72	44	E	128	190	0.97	103	F	213
SB L	80	0.08	9	A	8	90	0.09	9	A	8	140	0.15	9	A	13

a Demand.
b Volume to capacity ratio.
c Average total delay, in seconds per vehicle.
d Level-of-service.
e 95th percentile queue, in feet.

5

Mitigation

The following sections discuss improvement measures that will be implemented to minimize Project-related impacts. The result of these mitigation actions will not only mitigate the direct Project-related traffic demands but will also contribute to improving the overall traffic operations and pedestrian experience in the immediate vicinity of the project site. Mitigation measures presented in this chapter are set to take place prior to the introduction of the buildout of the Project.

Site Access

The first stage in defining the recommended improvements to the roadway system surrounding the Project site is to identify the improvements necessary to gain safe and efficient access to and from the site driveways along Route 20. The analysis of existing and future conditions in Chapter 4 indicate that with the suggested roadway improvements in place along Route 20, efficient movements into and out of the Project are expected. This section provides a summary of the roadway and intersection improvements that will address both existing deficiencies as well as the Project-related impacts.

Route 20/MassWorks

As part of the Commonwealth's MassWorks grant program, the Town of Shrewsbury was awarded $3.75 million to design and construct a portion of the Route 20 corridor in front of the Project site. The project is being led by the Town of Shrewsbury in conjunction with MassDOT and the project proponent with an expected initial construction start in 2020 and completion shortly thereafter. The MassWorks project includes an approximate 3,300-foot

section of the Route 20 corridor from the bridge at Flint Pond/Lake Quinsigamond to just past Puriton Way that will be widened to provide a full four-lane cross-section with appropriate shoulders, a shared-use bicycle/pedestrian pathway on the southern side of the corridor and turn lanes into the Project site. Additionally, it will include upgrades to the stormwater system, a new traffic signal at the intersection of Route 20 and Lake Street which will also serve as the main access point to the Project. Figure 17 shows the conceptual Site and design plan which have been conceptually reviewed by MassDOT and the Town of Shrewsbury and formed the basis of the MassWorks grant application. These plans are being refined now and are being advanced towards 25 percent design stage with MassDOT. Lastly, the proposed Edgemere at Flint Pond Project was fully accounted for (along with the potential for additional growth) in the development of these roadway plans.

As part of the MassWorks grant, the Proponent has committed to providing:

- Design funding for up to 75% of the total engineering and permitting of the overall project;
- Dedication of a significant amount of right-of-way (varying between five and 15-feet along the site frontage) to MassDOT, at no cost, which is required to construct the full width of the Route 20 roadway corridor and bicycle/pedestrian amenities; and
- Dedication of areas within the development site to MassDOT, at no cost, where stormwater from the widened Route 20 corridor can be detained, treated, and discharged in an appropriate manner along with the necessary infrastructure to support these BMPs.

As noted, the MassWorks project includes a significant investment in the Route 20 corridor near the Project. The timing of this roadway project has been relied upon by the Proponent as forming the basis for their project schedule. While both the Town of Shrewsbury and State continue to push this project forward with the expectation that the construction of the roadway work will commence in 2020, there is the possibility that delays may occur that are out of the control of any of the three parties. With this in mind, it is the Proponent's intention to proceed with the on-Site Project schedule independent of the MassWorks project schedule. In the case of a delay of the MassWorks project, the Proponent will work with MassDOT and the Town of Shrewsbury to develop an interim mitigation plan which will address the Project's transportation access needs.

Route 20 Site Access

As proposed, the MassWorks project considers the inclusion of two driveway access points into the Project. The primary access would be a signalized driveway opposite Lake Street. The secondary access would be an unsignalized driveway to the east that would provide for all movements except for left-turns out of the driveway.

Route 20 at Western Site Driveway/Lake Street (signalized)

Primary access to the project site will be provided at a signalized intersection opposite Lake Street. As shown in Chapter 4, Traffic Operations, this intersection under 2026 Build Conditions will operate at Level of Service C and D during the morning and evening peak

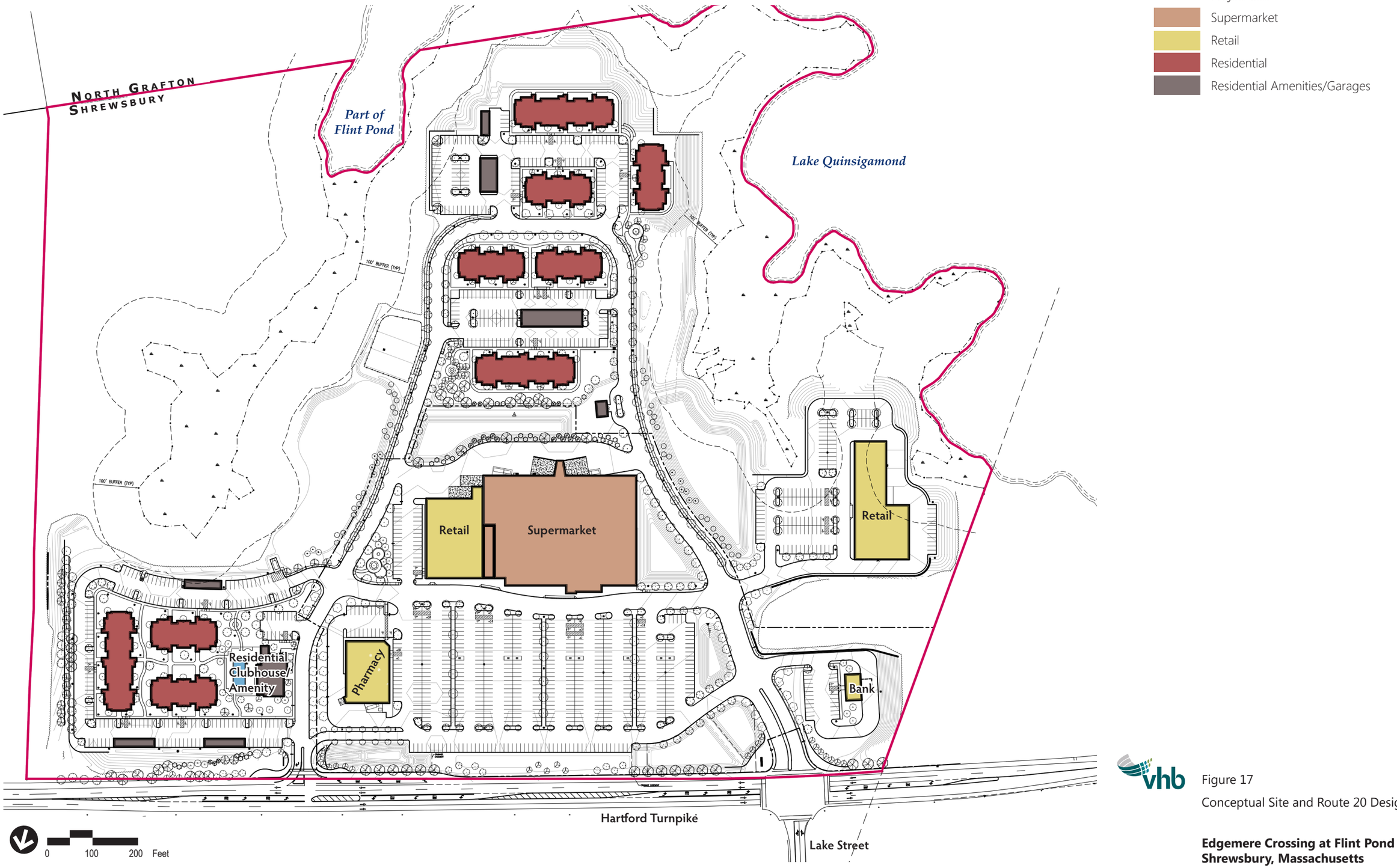


Figure 17
Conceptual Site and Route 20 Design Plan

Edgemere Crossing at Flint Pond
Shrewsbury, Massachusetts

hours, respectively. Saturday midday operations will also operate at LOS C during the peak periods. This intersection will include the following (subject to MassDOT design review):

- Left-turn lanes along Route 20 for traffic turning into Lake Street and the site driveway;
- Sidewalks on all four corners of the intersection, with a 10-foot shared bike/pedestrian pathway on the south side of Route 20;
- Highly visible crosswalks on all four legs of the intersection;
- Signage that is appropriate set back from the Route 20 mainline to not interfere with sight lines; and
- A new state-of-the-art, fully actuated traffic signal which will replace the existing antiquated signal.

Route 20 at Eastern Site Driveway (unsignalized)

Secondary access will be provided via an unsignalized driveway approximately 1,000 feet east of the signal with Lake Street. Because of sight-line issues, left-turns from this driveway onto Route 20 will be restricted via a raised divider island, but all other movements will be provided for.

As shown in Chapter 4, Traffic Operations, all critical movements at this intersection under 2026 Build Conditions will operate at Level of Service B and C during the various peak hour conditions. This intersection will include the following (subject to MassDOT design review):

- A protected left-turn lane along Route 20 for traffic turning into the site driveway;
- a 10-foot shared bike/pedestrian pathway on the south side of Route 20 across the site frontage; and
- Highly visible crosswalks across the site driveways.

Figure 17 illustrates the proposed driveways along the site frontage.

On-Site Circulation

The Site design will consider, from a transportation perspective, a well-planned series of connections amongst the residential development areas and the commercial areas. The Site Engineer has identified through layout and design a plan that promotes safe circulation for all modes (vehicular, bicycle, and pedestrian) within the Site, particularly between the residential and commercial areas. The site will include MUTCD compliant signage, sidewalks, appropriate grade lighting, and will also incorporate transition areas between the commercial and residential areas that could include one or a combination of speed limit signs, speed tables, crosswalks, and other traffic calming measures. Through the site plan review process, these elements will be identified and incorporated into the final site plan.

Off-Site Locations

In addition to those locations within the Town of Shrewsbury, the traffic study has identified two intersections within the City of Worcester that will see some additional traffic impact

associated with the Project's traffic. As part of the MEPA process, the proponent will be working with MassDOT and the City of Worcester to identify and quantify those impacts and develop reasonable mitigation actions designed to address the Project's traffic impacts on those locations.

Pedestrian and Bicycle Accommodation Improvements

As part of the Project, pedestrian and bicycle accommodations will be constructed on-site that will connect to the existing sidewalk network surrounding the Project Site. The on-site facilities include; crosswalks across the site driveways and at entrances to the proposed supermarket and retail buildings, sidewalks providing connections to the street and connecting parking areas, and bicycle racks. Along the site frontage, the Proponent will donate appropriate right of way to provide room for the MassWorks project to install a 10-foot wide shared use pathway connecting Puriton Way to the main entry point to the Project, approximately 2,400 feet.

Transportation Demand Management (TDM) Measures

In recognition of the existing and future traffic demands on the study area roadway system, several TDM measures are proposed and will be implemented by the Proponent to help reduce the number of single occupant vehicles (SOV) traveling to and from the Site, and to encourage the use of alternative modes of transportation to reach the Site and better manage the traffic generated by the Project.

Given the suburban nature of the Project and the limited transit options that are available, the Proponent expects to achieve at least a five (5) percent reduction in vehicle trips as compared to the projected ITE trip generation estimates. These TDM measures include the following:

- Provide an on-site and dedicated Transportation Management Coordinator (TMC) to facilitate and assist with the various TDM measures with both the commercial and residential users on the site;
- Install conduit in support of potential future electric vehicle charging stations where appropriate in parking areas;
- The Proponent will work with the Town of Shrewsbury in discussions with the WRTA to explore the possibility of expanding bus service to the Project Site. Should the WRTA be open to potentially modifying an adjacent bus route if the demand to/from the Project Site warrants, the Proponent will make appropriate accommodations within the site to provide for a bus shelter, as needed;
- Provide secure bicycle storage areas in the residential area and locate racks in areas near the entrances to the retail users;
- Provide an on-site ATM machine, cafeteria, and mail drop boxes for retail employees and customers that is customary for large commercial employers such as Market Basket;
- Review and evaluate employee and resident's transportation needs, and support a carpool and ride-matching coordination program through the promotion of NuRide or other MassRIDES initiatives;

- Designate preferential low emissions vehicle only spaces within general and employee parking areas;
- Use direct deposit for employee paychecks;
- Promote internet and shop-by-phone shopping alternatives where appropriate;
- Schedule supplier deliveries during weekday afternoon and off-peak hours where possible; and
- Construct the proposed pedestrian site access facilities (including sidewalks and crosswalks) to facilitate safe and easy pedestrian and bicycle access from the public roadway into the Project Site.

Transportation Monitoring Program

Traffic Monitoring Program

The Proponent will conduct an annual traffic monitoring program (TMP) to begin six months after initial occupancy of the Project and extend for a period of five years. The data collected as part of the TMP will be distributed to MassDOT (through MassRIDES) and MassDEP per their reporting requirements. The TMP will include ATR counts for a 24-hour period on a typical weekday and Saturday at the following locations:

- Western Site driveway;
- Eastern Site driveway; and
- Lake Street near Route 20

In addition, TMCs will be conducted on a typical weekday from 7:00 AM to 9:00 AM and from 4:00 PM to 6:00PM and on a typical Saturday from 11:00 AM to 2:00 PM at the following locations:

- Route 20 at Site driveway (west);
- Route 20 at Site driveway (east);
- Route 20 at Sunderland Road/Westborough Street;
- Route 20 at Grafton Street;
- Route 20 at Puriton Way

TDM Monitoring Program

In addition to the traffic monitoring program, the Proponent is also required to monitor the participation in, and effectiveness of the proposed TDM program on Site. The Proponent will work with the appointed on-site TDM coordinator to provide a summary of the participation rate for each business on-site and the estimated reduction in Site-generated traffic associated with the TDM measures in place throughout the Site. Consistent with the TMP, the annual TDM monitoring program will begin six months after full occupancy of the Project, and extend for a period of five years.

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Conclusion

Vanasse Hangen Brustlin, Inc. (VHB) has presented this transportation impact and access study for the construction of a mixed use development. The Project includes the construction of an approximately 80,000 square foot (SF) Market Basket supermarket, 50,000 SF of general retail space, 13,000 SF of pharmacy space, a 2,000 SF drive-in bank, and 250 units of rental residential units. Access to the Site will be provided via an unsignalized driveway along Route 20 (which restricts left-turns exiting the site) in the general location of the current driveway and a signalized, full-access driveway at the intersection of Route 20 and Lake Street. Full internal access for vehicles and pedestrians will be provided between the residential and commercial components of the Project.

Additionally, as part of the Commonwealth's MassWorks grant program, the Town of Shrewsbury was awarded $3.75 million to design and construct a portion of the Route 20 corridor in front of the Project site. The project is being led by the Town of Shrewsbury in conjunction with MassDOT and the project proponent with an expected initial construction start in 2020 and completion shortly thereafter. The MassWorks project includes an approximate 3,300-foot section of the Route 20 corridor from the bridge at Flint Pond/Lake Quinsigamond to just past Purinton Way that will be widened to provide a full four-lane cross-section with appropriate shoulders, a shared-use bicycle/pedestrian pathway on the southern side of the corridor and turn lanes into the Project site. Additionally, it will include upgrades to the stormwater system, a new traffic signal at the intersection of Route 20 and Lake Street which will also serve as the main access point to the Project.

The traffic analysis has identified locations impacted by the Project and the Proponent has developed a comprehensive mitigation package that effectively addresses both the potential

impacts of the development on the roadway network and existing issues. The Proponent is also committed to implementing a robust TDM plan.